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ABSTRACT

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THE INFLUENCE OF COGNITIVE STYLE AND INTELLIGENCE VARIABLES IN AIDED READING COMPREHENSION

Report from the Project on Conditions of School Learning and Instructional Strategies

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STATEMENT OF FOCUS

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CONTENTS

Acknowledgments iv

List of Tables vii

Abstract ix

Chapter

I. Rationale for the Study 1
II. Method 31
III. Results and Discussion 43
IV. Summary, Conclusions and Implications. 77

Appendices

A. Directions and Example of the Children's Embedded Figures Test 85
B. Directions and Example of the Adapted Form Sigel Cognitive Styles Tests 91
C. Directions and Example of the Matching Familiar Figures Test 95
D. Directions and Example of the Wisconsin Tests for Reading Skill Development, Level B--Comprehension, TEST 1: Paragraph Topics 101
E. Directions and Example of the Wisconsin Tests for Reading Skill Development, Level B--Comprehension, TEST 2: Before or After 105
F. Directions and Example of the Wisconsin Tests for Reading Skill Development, Level B--Comprehension, TEST 3: Outcomes. . . 109
G. Directions and Examples of the Wisconsin Tests for Reading Skill Development, Level B--Comprehension, TEST 4: Cause-Effect 113
H. Directions and Examples of the Wisconsin Tests for Reading Skill Development, Level B--Comprehension, TEST 5: Detail . . . 117

References 121

LIST OF TABLES

Table		Page
1	Inter-test Correlations of the WTRSD-B-C and Total Word Attack Skills	39
2	Descriptive Standardization Data including the Present Subject Pool	40
3	Interrater Agreement between Three Judges on Classification of Responses on the SCST	41
4	Summary of CEFT Ranges, Means and Standard Deviations	44
5	Summary of SCST Category Percentage Ranges, Means and Standard Deviations	45
6	Summary of MFFT Ranges, Means and Standard Deviations	46
7	Summary of WISC Ranges, Means and Standard Deviations	48
8	Summary of WTRSD-B-C Ranges, Means and Standard Deviations	49
9	Intercorrelation Summary of CEFT and WTRSD-B-C	50
10	Intercorrelation Summary of MFFT and WTRSD-B-C	53
11	Intercorrelation Summary of SCST and WTRSD-B-C	55
12	Frequency Distribution of SCST Response Patterns	57
13	Frequency Distributions for SCST Response Patterns and WTRSD-B-C Masters	59
14	Frequency Distribution for SCST Response Patterns and WISC-FS Ranges	60
15	Frequency Distribution of SCST Response Patterns and WISC-AI	61
16	Intercorrelation Summary of WISC-V and WTRSD-B-C	63

		Page
17	Intercorrelation Summary of WISC-P and WTRSD-B-C	64
18	Intercorrelation Summary of WISC-FS and WTRSD-B-C	65
19	Intercorrelation Summary of WISC-AI and WTRSD-B-C	66
20	Intercorrelation Summary of the SCST and CEFT	68
21	Frequency Distributions for SCST Response Patterns with Reflective-Impulsive and Field Dependent-Independent Subjects	70
22	Intercorrelation Summary of SCST and MFFT	71
23	Intercorrelation Summary of MFFT and CEFT	72
24	Interrelationship of Scores on MFFT and CEFT	73
25	Intercorrelational Levels of Significance Summary for CEFT, MFFT-E, WISC-FS, WISC-P and WISC-AI	75

ABSTRACT

The purpose of this study was to examine the interrelationships between five measures of aided reading comprehension (read to each subject while he silently read or followed along), intelligence and three measures of cognitive style variables in first grade children. The Wisconsin Tests of Reading Skill Development, Level B-Comprehension (WTRSD-B-C) yielded the five aided reading comprehension measures:

1. Identifying a paragraph topic or main idea (WTRSD-PT).
2. Determining sequence or recalling events that happened just before or just after another event in a short paragraph (WTRSD-BA).
3. Using logical reasoning in predicting outcomes (WTRSD-O).
4. Using logical reasoning in synthesizing information or judging cause and effect (WTRSD-CE).
5. Reading for details or selectively attending to and recalling details in a short paragraph (WTRSD-D).

The three measures of cognitive style variables utilized in the study included:

1. Field Dependence-Independence, sometimes referred to as global-analytic style, was measured with the Children's Embedded Figures Test (CEFT).

2. Style of Categorization, sometimes referred to as conceptual style, was measured with the Sigel Cognitive Styles Test (SCST).
3. Reflectivity-Impulsivity, sometimes referred to as conceptual tempo, was measured with the Matching Familiar Figures Test (MFFT).

The Wechsler Intelligence Scale for Children (WISC) served as the intelligence measure. Four scores were utilized as variables in the study: Full Scale, Verbal, Performance and Analytic Index, which includes the subtests of Block Design, Picture Completion and Object Assembly.

Thirty-four first graders, 13 boys and 21 girls, served as subjects. The WISC, MFFT, CEFT and MFFT were individually administered and the WTRSD-B-C were administered in group situations. Ten specific questions were formulated to guide the examination of interrelationships among the test scores.

Significant relationships were found as follows:

1. CEFT and WTRSD-D, with intelligence controlled, for females and the total sample ($p<.01$).
2. MFFT-Errors and WTRSD-D, with intelligence controlled, for females and the total sample ($p<.01$).
3. SCST-DPW (Descriptive Part-Whole percentage of total responses) and the WTRSD-PT for females ($p<.10$).
4. Forty-four of the sixty coefficients between the four WISC measures and the WTRSD-B-C. The WTRSD-BA was significantly

correlated with all four WISC measures with males, females and total sample.

5. CEFT and SCST-RC (Relational-Contextual percentage of total responses), for females ($p<.024$).
6. MFFT-average response times and SCST-DPW for males ($p<.017$) and the SCST-RC for males ($p<.025$) and the total sample ($p<.037$).
7. MFFT errors and SCST-DPW for females ($p<.087$) and the SCST-RC for females ($p<.089$).
8. CEFT and MFFT-errors for males ($p<.024$), females ($p<.001$) and total sample ($p<.000$).

A common factor appeared to be measured by the CEFT, MFFT errors and WISC-AI which seemed significantly related to WTRSD-D, or the finding and recalling of details in a short paragraph.

Some difficulty in the traditional interpretation of SCST results was found. The author suggested a procedure in which various response patterns on the SCST may be used in examining the relationship between aided reading comprehension skills and other cognitive style variables.

It was concluded that cognitive style tests can provide useful information to a reading teacher. Also the role which cognitive style variables play in terms of current conceptual and theoretical models of reading comprehension processed should continue to be examined.

CHAPTER 1

RATIONALE FOR THE STUDY

General Problem

The search for measurable individual difference variables which affect a student's ability to learn specific academic skills has been a central concern of psychologists and educators for over 65 years. Since reading has been one of the major academic skills emphasized in the schools, it is not surprising to find considerable research exploring the thinking processes involved in learning to read and reading to learn. In 1908, Huey (1968) wrote:

> And so to completely analyze what we do when we read would be the acme of a psychologist's achievements, for it would be to describe very many of the most intricate workings of the human mind, as well as to unravel the tangled story of the most remarkable specific performance that civilization has learned in all its history. (p. 6)

This is just as true today as it was then, even though the disciplines of experimental and educational psychology, linguistics, psycholinguistics and educational measurement have isolated and measured many different information-processing variables implicated in the differential acquisition of a student's learning skills and abilities. In recent years, the cognitive and affective processes that are utilized while reading have been placed in the broader context of a

general communication model by Athey (1971), Geyer (1972), Goodman (1968, 1970), Ruddell and Bacon (1972) and Venezky and Calfee (1970) among others.

Information processing variables subsumed under the construct of cognitive styles are of central importance to the present study. A wide variety of constructs or skills referred to as cognitive styles (Coop and Sigel, 1971; Santostefano, 1969; Bruner, Goodenough and Austin, 1956) are found in the literature. For this study, cognitive style variables are divided into three types:

1. Field Dependence-Independence, sometimes referred to as a global-analytic style, was developed by Witkin (1949, 1950, 1965) and Witkin, et al.(1954, 1962) and measured in this study by the Children's Embedded Figures Test (Karp and Konstadt, 1971). This variable refers to the ability to focus on small parts of a complex figure rather than on the figure as a whole.
2. Style of Categorization, sometimes referred to as conceptual style, was developed by Kagan, Moss and Sigel (1963) and Sigel, Jarman and Hanesian (1963) and measured in this study by the Sigel Cognitive Styles Test (Sigel, 1967). This variable refers to the manner in which a subject selects pairs of objects from a set of three which go together and are similar in some way.
3. Reflection-Impulsivity, sometimes referred to a conceptual tempo, was developed by Kagan, Rosman, Day, Albert and Phillips (1964) and measured in this study by the Matching

Familiar Figures Test (Kagan, 1965a). This variable refers to a subject's tendency to wait and reflect on the choice.

With the increased emphasis on individualized instruction, educators and psychologists are searching for those identifiable and fairly stable information processing variables which influence a student's ability to learn. Additional research needs to focus on the identification and the reliable measurement of cognitive styles variables as they relate to the acquisition of specific academic skills. More precise prescriptive teaching styles can then be developed and appropriately utilized.

Further analysis of the cognitive style variables is essential for our increased understanding of the various models and conceptual frameworks proposed to explain the process of reading. Jenkinson (1969) states

> "... a model which deals with the reading process as such, which includes the cognitive interactions, the impact of language and linguistic considerations in the affective as well as in the cognitive domain, and will then attempt to relate these reading operations to other aspects of thinking, is perhaps most urgently needed." (pp. 14-15)

The more precisely we examine the similarities and differences of various cognitive or intellectual process variables, as they relate to skills and processes implicated in reading comprehension, the more useable data we obtain to help formulate the partial reading process models and conceptual framework called for by Jenkinson and others.

This study focuses in part, then, on the informational processing variables referred to as cognitive styles as they relate to the thinking processes involved in reading comprehension. A study of this kind will provide additional information useful to those concerned with

the development of theoretical models of the reading process. For example, do cognitive styles play a different role than those processes subsumed under intelligence when a person recalls and identifies details from a story after he reads it?

Statement of the Problem

In this study the interrelationships between intelligence and aided reading comprehension and cognitive styles were explored. Specifically examined were the intercorrelations of three cognitive style variable measures, a measure of intelligence and five measures of aided reading comprehension in first grade males and females.

The first cognitive style test, Children's Embedded Figures Test (CEFT), is a measure of field dependence-independence or the ability to find a figure hidden in a larger and more complex figure. The second cognitive style test, Sigel Cognitive Style Test (SCST), is a measure of one's style of categorization, sometimes referred to as conceptual style. In the SCST the subject selects, from a series of three item sets, pairs of items which go together or are alike in some way and explains why he made that choice. These choices are then classified as being either Descriptive Part-Whole, (DPW), Descriptive Global (DG), Relational-Contextual (RC) or Categorical-Inferential (CI). The third cognitive style measure, Matching Familiar Figures Test (MFFT), is a measure of reflection-impulsivity, sometimes referred to as conceptual tempo. The MFFT examines the manner in which a subject responds, in terms of errors and response time, when matching a familiar figure to an identical one in

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a field of six slightly different variations. Examples of these cogni-
tive style tasks are included in Appendices A-C.

Intelligence as measured by the Wechsler Intelligence Scale
for Children (WISC). Four scores were used as veriables: Full Scale
(FS), Verbal (V), Performance (P) and Analytical Index (AI). The AI is
derived by combining the scaled scores of three of the Performance sub-
tests (Block Design, Picture Completion and Object Assembly).

The five aided reading comprehension tests taken from the
Wisconsin Tests for Reading Skill Development, Level B--Comprehension
(WTRSD-B-C), examine the following variables: identifying a paragraph
topic, determining sequence, using logical reasoning in predicting out-
comes, using logical reasoning in synthesizing information and reading
for details. For this study, the term aided reading comprehension is
used, because each test item is read orally to the students while they
read it silently to themselves. These tests, therefore, emphasize a
somewhat different variety of skills and processes than tests that
require the subject to rely exclusively on his own reading skills for
the visual input of information. This is discussed in a subsequent sec-
tion of this chapter.

Four features make this study different from the majority of the
relatively few correlational studies examining the interrelationships
between various cognitive styles, intelligence, and reading variables.
First, to the best of the author's knowledge, no other study has in-
cluded all three of the major cognitive style measures in a single study.
Secondly, the four intelligence variables utilized in this study are
derived from the individually administered WISC which has been proven

to be more reliable and precise than many of the abbreviated and/or group administered intelligence measures (Nunnally, 1959). Thirdly, this study utilized first grade students who represent a younger subject pool than is usually found (Serafica and Sigel, 1970; Cohn, 1968; Annesley, 1971; and Davey, 1971). Cognitive styles may play a much different role when a student is learning to read than when a student is reading to learn. Finally, because of their age, the present subjects had mastered fewer word attack reading skills than the older subjects usually utilized in studies involving reading and cognitive style variables. Because the thrust of this study is on the interaction of various intelligence and cognitive style variables implicated in the reading process, word attack skills have been controlled by the use of the aided reading comprehension measures.

The purpose of this study was to examine the intercorrelations, for first grade boys and girls, between intelligence, aided reading comprehension and cognitive styles. To that end, 16 variables were identified:

1. Children's Embedded Figures Test (CEFT)
2. Matching Familiar Figures Test-Errors (MFFT-E)
3. Matching Familiar Figures Test-Reaction Time (MFFT-RT)
4. Sigel Cognitive Style Test-Description Part Whole Percentage (SCST-DPW)
5. Sigel Cognitive Style Test-Description Global Percentage (SCST-DG)
6. Sigel Cognitive Style Test-Relational-Contextual Percentage (SCST-RC)
7. Sigel Cognitive Style Test-Categorical-Inferential Percentage (SCST-CI)

8. Wechsler Intelligence Scale for Children-Full Scale (WISC-FS)

9. Wechsler Intelligence Scale for Children-Verbal (WISC-V)

10. Wechsler Intelligence Scale for Children-Performance (WISC-P)

11. Wechsler Intelligence Scale for Children-Analytic Index (WISC-AI)

12. Wisconsin Tests for Reading Skill Development-Paragraph Topics (WTRSD-PT)

13. Wisconsin Tests for Reading Skill Development-Before and After (WTRSD-BA)

14. Wisconsin Tests for Reading Skill Development-Outcomes (WTRSD-O)

15. Wisconsin Tests for Reading Skill Development-Cause-Effect (WTRSD-CE)

16. Wisconsin Tests for Reading Skill Development-Detail (WTRSD-D)

Another abbreviation used throughout the present study is WTRSD-B-C which refers to the Wisconsin Tests for Reading Skill Development, Level B-Comprehension and includes all five of the above mentioned tests (WTRSD-PT, WTRSD-BA, WTRSD-O, WTRSD-CE and WTRSD-D).

Questions

Specifically, the following questions were answered by this study:

1. a. To what degree is field dependence-independence (CEFT) associated with performance of the following aided reading comprehension skills (WTRSD-B-C):

   1) Identifying a paragraph topic (WTRSD-PT)

   2) Determining Sequence (WTRSD-BA)

   3) Using logical reasoning in predicting outcomes (WTRSD-O)

4) Using logical reasoning in synthesizing information (WTRSD-CE)

5) Reading for details (WTRSD-D)

b. To what degree is field dependence-independence (CEFT), with total intelligence (WISC-FS) controlled, associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

2. a. To what degree is reflection-impulsivity (MFFT-E, MFFT-RT) associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

b. To what degree is reflection-impulsivity (MFFT-E, MFFT-RT), with total intelligence (WISC-FS) controlled, associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

3. a. To what degree is style of categorization (SCST-DPW, SCST-DG, SCST-RC, SCST-CI) associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

b. To what degree is style of categorization (SCST-DPW, SCST-DG, SCST-RC, SCST-CI), with total intelligence (WISC-FS) controlled, associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

4. To what degree is verbal intelligence (WISC-V) associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

5. To what degree is nonverbal intelligence (WISC-P) associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

6. To what degree is total (verbal and nonverbal) intelligence (WISC-FS) associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

7. To what degree is the Analytic Index (WISC-P subtests: Block Design, Object Assembly and Picture Completion) associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

8. To what degree is style of categorization (SCST-DPW, SCST-DG, SCST-RC, SCST-CI) associated with field dependence-independence (CEFT)?

9. To what degree is style of categorization (SCST-DPW, SCST-DG, SCST-RC, SCST-CI) associated with reflection-impulsivity (MFFT-E, MFFT-RT)?

10. To what degree is reflection-impulsivity (MFFT-E, MFFT-RT) associated with field dependence-independence (CEFT)?

Cognitive Style Construct

Before examining the cognitive style variables of field dependence-independence, style of categorization and reflection-impulsivity, mention should be made of another strand of research closely related to cognitive styles but which was not explored in depth in this study. This research led to the development of "cognitive control principles". Principal investigators carrying out this research were Klein (1954, 1958), Gardner (1953, 1962) and Gardner, et al. (1959, 1960, 1968).

> Specifically, cognitive controls are defined as mechanisms or principles which: (1) govern and determine the amount and organization of information which becomes available to an individual perceiver, (2) are activated by specified classes of stimuli which cause the individual to experience some intention to use and adapt to the information, (3) vary in the extent to which they operate in the cognitive functioning of individuals, (4) evolve, in part, as a function of maturation and life experiences and become independent . . . from their origin of development, (5) mediate the influence of personality and motivation in the individual's cognitive encounters with the environment and (6) become enduring aspects of an individual's cognitive functioning and adaptive style, and, thus, give shape to his subsequent cognitive experiences. (Santostefano, 1969, pp. 295-6)

Klein classified the resulting variables from his work into four cognitive control principle dimensions: focusing-scanning, constricted-flexible, leveling-sharpening and equivalence range. The second dimension, contricted-flexible, is identical to that of Witkin's field dependence-independence. For a complete review of the evolution

of cognitive controls and their relationship to cognitive styles, see Santostefano (1969).

Santostefano, Rutledge and Randall (1965) utilized the cognitive controls dimensions of focusing-scanning, constricted-flexible and leveling-sharpening in three experiments dealing with 24 boys (ages 8-13) selected by teachers as having a reading disability. Only the constricted-flexible dimension was implicated in reading disability. Because of the similarity of the constricted-flexible dimension to Witkin's field dependence-independence, Santostefano, Rutledge and Randall's (1965) non-significant results with regard to the other two cognitive styles and cognitive controls, the latter were not included in the present study.

Field Dependence-Independence

Witkin, Dyk, Faterson, Goodenough and Karp (1962) state that:

> The person with a more field-independent way of perceiving tends to experience his surroundings analytically, with objects experienced as discrete from their backgrounds. The person with a more field-dependent way of perceiving tends to experience his surroundings in a relatively global fashion, passively conforming to the influence of the prevailing field or context. (p. 35)

There have been two different methods of assessment used in identifying the field dependent-independent cognitive style. The first can be classified as examining a subject's ability to orient an object in space. Witkin's (1949) early work involved the use of tasks involving a tilting room and/or chair. The subject's task was to evaluate the position of his body and of the surrounding field in relation to the upright. A modified version widely used today is the Rod and Frame Test

(Witkin, Lewis, Hertzman, Machover, Meissner and Wapner, 1954). This task requires the subject to adjust a luminous rod attached within a luminous square frame to a vertical position thus measuring the subject's perception of an item in a field.

The second approach to identifying field dependence-independence is developed from the work of Witkin (1950) and Goodenough and Eagle (1963) who emphasized the overcoming of an embedding context in perception. Here the task involves looking at a complex geometric figure and finding or disembedding a simpler one. Several tests have been developed: Embedded Figures Test (EFT) (Witkin, 1950), a shortened form of EFT (Jackson, 1956), an easier version of EFT for younger children (CHEF) (Goodenough and Eagle, 1963), the Children's Embedded Figures Test (CEFT) (Karp and Konstadt, 1971), a Group Embedded Figures Test (GEFT) (Witkin, Ottman, Raskin and Karp, 1971) and the Hidden Figures Test (HFT) (Educational Testing Service, 1962). After consideration, the author chose to use the CEFT in the present study because it appears to be the most valid measure of field dependence-independence developed for the age group of the present subjects.

Research suggests that the trait is relatively stable over time (Witkin, 1949; Goodenough and Karp, 1969), a single trait is validly and reliably measured by the two different assessment methods (Witkin, 1949; Busch and Simon, 1972), precision increases developmentally with age at varying rates (Busch and Simon, 1972; Witkin, 1949; Witkin, Goodenough and Karp 1967) and males between 8-17 appear to be more field independent than females (Witkin et al., 1967; and Witkin, 1949). No correlational difference was found between EFT test and Rod and Frame Test performance

for 5-7 year olds (Busch and Simon, 1972). Nelson (1972, p. 29), after reviewing related literature, concluded

> that field-independent subjects are superior to field-dependent subjects in situations requiring the acquisition of concepts, but that field-dependent persons are more sensitive to social cues. There is no such generalization which can be made concerning personality traits and the tendency to be field-independent or dependent.

For an extensive review of the wide range of research dealing with field dependence-independence see Kagan and Kagan (1970), Witkin, Dyke, Faterson, Goodenough and Karp (1962) and Santostefano (1969). Validity and reliability information on each of the cognitive style tests used in the present study are presented in Chapter 2.

Twelve studies were located which examine the relationship between field independence-dependence and various reading-related variables. Only the first of these studies used the Children's Embedded Figures Test. Watson (1969) examined field dependence-independence as measured by the CEFT with first, second and third grade boys as it related to the reading portion of the Stanford Achievement Test and the Draw-a-Person Test. In her rationale for the study she relies heavily on the factor analytic perceptual studies of Thurstone (1944, 1949), Botzum (1951) and Pemberton (1952) and Goins' (1958) work on visual perception. A common factor in these studies was found to be quite similar to Witkin's (1962) conception of field dependence. Watson (1969, p. 11) points out that this factor, which deals with perceptual closure, or overcoming an embedding context, was examined in detail because "decoding from graphic to phonic patterns was shown to be the major task in early reading. The critical factor in the decoding and transfer process was found to be a

graphic unit with an invariant relationship to a phonemic unit." In her first grade sample, product-moment correlation coefficients between the CEFT and the SAT (1964 revision) subtests were as follows: Word Reading, .54; Paragraph Meaning, .57; Word Study Skills, .64; and Vocabulary, .66. Correlation coefficients were significant at the .01 level for Paragraph Meaning, Word Study Skills and Total Reading. In short, Watson (1969, p. 43) found "that field independent boys in grades one through three are better readers than field dependent boys of the same age."

Wineman (1971), using 4th, 5th and 6th grade subjects, examined field dependence-independence by evaluating human figure drawings using a method described by Witkin, et al. (1962). They used the California Reading Test-Elementary (CRT) in grades 4 and 5 and used the California Achievement Test-Elementary (CAT) in grade 6. Significant ($p<.05$) correlation coefficients were found between the CRT scores for male and female 4th grade subjects and the human drawing analysis but this was not found for 5th grade subjects. Significant ($p<.01$) correlations were found between the two CAT scores (Reading Vocabulary and Reading Comprehension) of both males and females in the 6th grade. Fiebert (1967) found a low-level relationship between field independence and reading ability for deaf girls but not for deaf boys. Stuart (1967) also found that field independence may be related to better reading skills. The latter two studies were cited by Wineman.

Keogh and McG. Donlon (1972) found that twenty-seven boys classified as having severe learning disorders and 25 boys with mild hearing disorders were significantly ($p<.01$) more field dependent than norms would suggest as measured by the Portable Rod and Frame Test. They

found that boys with severe learning disorders were also impulsive as measured by the MFFT (Kagan, 1965a). Their work suggests that when field dependence and impulsivity are combined in a single subject, the degree of learning disability was more severe. The present study examined this interrelationship further.

Boersma, et al. (1969) presented anagram tasks to field dependents and independents and then examined their corneally reflected eye movements. Field independent subjects made more shifts in fixations, although neither group performed more successfully than the other on the tasks. Males made more shifts than females and field independent males attended to more letters in each problem than did dependent males. For females, this later finding was reversed.

Nadien, Schaeffer and Schmeidler (1969) compared field dependence and independence and reading scores from the Nelson-Denny Reading Tests of 35 college students with regard to strong eye dominance and the subject's mood. For subjects indicating a negative mood, field dependence was associated with weak eye dominance and poor comprehension, while in a positive mood situation, weak eye dominance was associated with slower reading and a strong correlation between reading speed and comprehension. In short, field dependence was found to be related to weak ocular dominance only for subjects indicating a negative mood.

Higgins and Gage (1968) utilized the EFT and Nelson-Denny Reading Test with 12 college students. Reading was pre- and post-tested. While the group which was more field independent made a greater gain, no relationship between field dependence-independence and reading ability was apparent before instruction. Also using the EFT with high school

students. Peterson and Magaro (1969) failed to confirm the following two hypotheses: (1) Scores on the EFT will be significantly correlated with reading achievement (Wide Range Achievement Test) when intelligence is partialled out, and (2) In the learning of a reading related task, increased embeddedness will have a more retarding effect on the learning rate of field dependent than independent subjects.

Cohn (1968) dealt in some depth with the relationship between field dependence-independence and reading comprehension in 6th grade subjects. He utilized the EFT, the Lorge Thorndike Intelligence Test and the Sangren-Woody Reading Test. His results can be summarized as follows:

1) A significant positive relationship existed between EFT and four reading subtests: Details ($p<.05$), Main Ideas ($p<.01$), Sequence ($p<.01$) and a Total Score ($p<.05$).

2) A significant positive relationship existed between verbal intelligence and all 8 reading measures of reading comprehension.

3) A significant positive relationship existed between nonverbal intelligence and all 8 measures of reading comprehension.

4) A significant positive correlation existed between total intelligence and all 8 measures of reading comprehension.

5) There was no significant correlation between sex and all 8 measures of reading comprehension.

Cohn (1968) points out that

> . . . field independence was positively and significantly correlated with those aspects of comprehension that required reorganization of a field to solve a problem, apparently when the solution had to be found through new cognitive activity rather than through reliance upon experience and external authority. This study is the first one known to this writer which links specific aspects of reading comprehension and perception together. (pp. 2-3)

Having reviewed these studies, it was apparent to the author that there is a need to confirm the relationship between reading comprehension variables and field dependence-independence at an earlier grade level than Cohn's sample. Intelligence variables need also to be examined in this context. The interrelationship between MFFT scores (reflection-impulsivity) and field dependence-independence also needs further exploration which is, in part, the purpose of the present study.

Style of Categorization

Sigel, Jarman and Hanesian (1967, p.2) describe four classification categories used to identify a style or "preferential mode of categorization expressed in a situation where alternatives are possible." Using sorting or matching tasks in which the subject expresses his reasons for pairing two objects, Kagan, Moss and Sigel (1963) and Sigel (1967) have identified the following styles of categorization:

1. Descriptive--similarities identified on the basis of manifest objective attributes.

    a. Descriptive part-whole--responses denoting observable parts of an item; e.g. classifying human figures as similar "because they all have hats," or "because they are holding an object in their hands"; or a group of objects "becuase they all have wooden handles," or a table and chair "because they have four legs."

    b. Descriptive-global--similarities based on the total objective manifestations of the stimuli; e.g. classification of human figures as similar "because they are nurses," or "because they are female," or "because they are young".

2. Relational-contextual--responses denoting functional or thematic interdependence between the elements in a grouping. The interdependence is particular to that situation and not generalizable. The meaning of any one stimulus in the grouping is defined by its relationship to other stimuli; e.g. a horse and a stagecoach go together "because the horse pulls the stagecoach," or a table and chair are selected "because you sit on the chair to eat at the table." The items may be related in time and place in a particular context. Also, relationships may be organized along a thematic basis; e.g. "the mother is feeding the baby."

3. Categorical-inferential--items classified on the basis of inferred characteristics of the stimuli.

   a. Functional--items grouped on the basis of inferred use; e.g. a bed and a cradle are grouped because "these are things to sleep in," or a stagecoach and jeep are selected because "these are things to ride in," or a hammer and saw go together because "they are used in building."

   b. Class-naming--classification on the basis of class membership; e.g. a cow and a horse are grouped because "they are vertebrates," "they are animals," or bananas and grapes are selected because "they are foods."

   c. Attribute selection--where a specific non-manifeste attribute is inferred; e.g. an orange and a banana are grouped together because "they grow," or "they have seeds."

   d. Location--inference as to where an item belongs geographically; e.g. a cow and sheep are grouped together because "they live on a farm," or a bed and chest because "they are found in the bedroom." (Sigel, Jarman and Hanesian, 1967, p.7)

Three major assessment procedures are used by researchers to examine these styles of categorization. The first, a figure sorting task (Kagan, Moss and Sigel, 1963), is geared to adults and consists of selecting from a group of three pictures of people the two which go together on some common basis. Thirty-two response choices are possible,

each of which is scored as belonging to one of two orientations (egocentric or stimulus centered) and one of the three general style categories of analytic-descriptive, relational or inferential-categorical.

The second test, the Conceptual Style Test (CST) (Kagan, Moss and Sigel, 1963), is for children and consists of 30 sets of three black-and-white drawings. The child selects two of the drawings and tells why they go together. The content of the test drawings lends itself mainly to descriptive and analytical responses.

The third assessment procedure is the Sigel Cognitive Style Test (SCST) (Sigel, 1967). It was utilized in the present study. There are two forms, one for boys and one for girls. Scoring and classification of the responses was outlined at the beginning of this section as described by Sigel, Jarman and Hanesian (1967). This test differs from the CST in the addition of the Descriptive-Global category.

Three studies provide the bulk of stability and developmental trend data concerning styles of categorization (Kagan, Moss and Sigel, 1963, Kagan et al., 1964 and Sigel, 1953). Generally, descriptive responses increase with age while relational responses decrease. People using a descriptive or analytic style in their response appear to attend better to factual detail in concept acquisition. Lee, Kagan and Rabson (1963) found that boys using a more descriptive response style learn more rapidly concepts requiring pictorial stimuli analysis. Those classified as analytic or descriptive in their response style scored better on performance tests than on verbal tests (Kagan et al., 1964). Additional studies dealing with concept learning and styles of categorization include: Nelson, 1972; Beller, 1967; Davis, 1967; Lee, Kagan and

Rabson, 1963; Ohnmacht, 1966; Frederick, 1968 and Elkind, Koegler and Go, 1963. Those subjects found to be non-analytic however, tend to score better on verbal tests and tend to be more impulsive than analytical subjects on conceptual tempo tasks like the MFFT. (Kagan, Moss and Sigel, 1963; and Kagan et al., 1964). Coop and Brown (1970) point out that there does not appear to be a significant difference between analytic and non-analytic subjects in terms of total IQ scores. Scott (1972) found that analytical can be developed and enhanced through the use of the Inquiry Process training which had lasting effects over a five to six year period. All three major styles or categorization (descriptive, relational and inferential) can be found at all levels of development from pre-school through adolescence (White, 1971; Kagan, Moss and Sigel, 1963 and Sigel, Jarman and Hanesian, 1967).

Five studies were found that related styles of categorization to various reading related variables. Garrettson (1971) examined the interrelations between the CST, five Piagetian tasks and reading achievement as measured by the Metropolitan Reading Achievement Test, Primary I Battery. The CST and reading achievement test correlation coefficient (r=.18) was not significant for her sample of second grade boys.

Serafica and Sigel (1970) state:

> The concept of cognitive styles implies that each child approaches the task of learning to read with his own established patterns for coping with environmental stimuli. Certain modes of categorization may facilitate the reading process whereas others may be disfunctional for the task requirements. (p. 106)

Kagan, Moss and Sigel (1963) felt that an analytic attitude may aid in early reading mastery. Serafica and Sigel (1970) go on to state:

> Noticing the differences between such words as "cat" and "bat" and "dog" and "bog" requires differentiation and analysis of the stimulus. Such cognitive operations call for reflection. The child who is restless and impulsive is less likely to be analytic and will therefore be more apt to encounter difficulty in learning to read than his peer who possesses greater capacity and/or tolerance for delay. Furthermore, preference for a relational-contextual approach which involves passive acceptance of the entire stimulus as a figure without background elements and a tendency to establish associations based on global impressions or idiosyncratic experience is likely to mislead the child as he endeavors to make sense out of the maze of symbols on the printed page. (p. 106)

For them, reading is an active, perceptual-cognitive process involving differentiated perception, organization and integration. A student scans his memory system for relevant cues and then distinguishes them from irrelevant cues. This can be easier for the student with an analytic style of categorization. Relevant characteristics can be categorized, which aid the student in the forming of class relationships and finally make it possible to deal meaningfully with larger information units. Making inferences then should facilitate comprehension.

Specifically Serafica and Sigel (1970) compared a group of 24 boys (ages 8-10) who were functioning at least one year below grade level and who had a history of reading disability with a control group without identified reading problems. The SCST was given to both groups. The nonreaders used significantly more relational-contextual responses. Significantly higher mean scores for descriptive whole responses and two of the categorical-inferential response categories were obtained by the nonreaders. They concluded that readers and nonreaders differed in their conceptual and integrative abilities. Boys who could read used their analytic ability to selectively attend to specific descriptive features

GPO 804-850-2

to help with the forming of concepts, while nonreaders stopped at analysis.

Davey (1971) used Goodman's Oral Reading Inventory and scored it according to the Goodman Taxonomy of Oral Reading Errors. She also gave the SCST. She examined differences between 38 fourth grade boys who were either achievers or underachievers in reading and either analytic or non-analytic in their cognitive style.

> Significant findings ($p < .05$) resulting from analyses of variance for twenty-eight categories of oral reading errors included: (1) achievers and underachievers differed in errors resulting in minimal meaning change and in noncorrected errors resulting in extensive meaning change; (2) boys of an analytic style differed significantly from boys of a non-analytic style in punctuation errors and in errors of high syntactic acceptability with low graphic acceptability; (3) analytic achievers and non-analytic achievers differed in punctuation errors and errors of high syntactic acceptability with low graphic acceptability; (4) analytic achievers and analytic underachievers differed in noncorrected errors resulting in extensive meaning change; (5) non-analytic achievers and non-analytic underachievers differed in errors with low syntactic acceptability; and (6) analytic underachievers and non-analytic underachievers differed in errors of high syntactic acceptability with low graphic acceptability. (Davey, 1971)

Annesley (1971) examined the relationships between the SCST, the Slosson Intelligence Test (SIT, 1965) and reading achievement in 80 fifth grade boys. Reading achievement was evaluated by an elaborate screening of subjects utilizing the Iowa Test of Basic Skills, teacher evaluations and an informal reading inventory which resulted in below average, average and above average ratings. He found:

1. No significant difference in the frequency of the use of RC responses for various reading levels.

2. Above average readers used more descriptive DPW responses than below average readers and average readers. Average

and below average readers showed no significant differences on DPW responses.

3. Below average and above average readers cannot be differentiated in their use of CI responses.

4. RC increases as does IQ with below average intelligence subjects showing significantly lower response rates than those with either average or above average intelligence.

5. IQ levels are not related to DPW responses.

6. CI is not a function IQ.

Taken as a whole, these studies imply that styles of categorization can play an active role in a student's ability to read. To find out specifically what this role involves will require considerable research with regard to the interaction of intelligence skills, reading related variables and various patterns of these styles of categorization. One of the specific focuses of the present study was the examination of the various styles of categorization as they relate to the WISC, MFFT, CEFT and WTRSD-B-C.

Reflection-Impulsivity

Kagan (1966) states that:

> The reflection-impulsivity dimension describes the degree to which a child reflects upon the differential validity of alternative solution hypotheses in situations where many response possibilities are available simultaneously. In these problem situations the children with fast tempos impulsively report the first hypothesis that occurs to them, and this is typically incorrect. The reflective child, on the other hand, delays a long time before reporting a solution hypothesis and is usually correct. (p. 119)

There are three assessment tests usually utilized in measuring this reflection-impulsivity variable, sometimes referred to as conceptual tempo. These measures record two scores for each subject: reaction time before the first response and the number of errors. They include

the Haptic Visual Matching (HVM) test, the Design Recall test (DRT), and the Matching Familiar Figures test (MFFT) (Kagan et al., 1964). The HVM involves tactually feeling a three-dimensional wooden geometric form or a familiar object which the subject can't see. Then the subject must select the form from a five variant visual array. Time taken to explore the form is also recorded. The DRT involves looking at a geometric design 15 seconds, and then finding it in an array of several variants of the design. The MFFT involves a similar task where the figures viewed are meaningful figures (houses, trees, dresses) instead of geometric designs. Response time to the nearest half-second for the first response of each of 12 sets of pictures and total number of errors are recorded. Those subjects scoring above the median of total errors and below the average response time median are classified as Impulsive. Those subjects with low errors and high response time are classified as Reflective. Research suggests low to moderate stability. Lewis, Rousch, Goldberg and Dowd (1968) found no sex differences on a MFFT-like test in a group of three and four year-old subjects. Bosserman (1971) found response times and errors to be more highly correlated in boys than in girls. Meichenbaum and Goodman (1969) found girls in kindergarten had significantly longer RT's than boys.

The Reflection-Impulsivity variable has been tied to a wide variety of educationally related variables. These include body build (Kagan, 1966) anxiety on mirror tracing (Barratt, 1959), verbal control of motor behavior (Meichenbaum and Goodman, 1969), inductive reasoning (Kagan, Pearson, and Welch, 1966), and a wide variety of concept learning studies (Nelson, 1972). Messer (1970) found that impulsive subjects were

more prevalent in a group who repeated grades. After reviewing studies dealing with attempts to train impulsive subjects to be more reflective by modeling behaviors, Nelson (1972) found that while response times could be increased, number of errors could not be decreased. Also, when training in reflective techniques did succeed in reducing the subjects' errors on the MFFT, their response times were not increased.

There are four studies which relate MFFT variables to a variety of reading-related variables. Yando and Kagan (1968) examined 80 first grade boys and 80 first grade girls from 10 classrooms with impulsive and 10 with reflective female teachers. Subjects were tested with the MFFT in the fall and in the spring. Among the variables intercorrelated were the MFFT errors and MFFT response times both for fall and spring, the Metropolitan Reading Readiness Test, socioeconomic class and teacher evaluation of the child. Significant relationships were found between: the MFFT-E (Fall and Spring) and Metropolitan for girls; and the MFFT-RT (Spring) and the Metropolitan for girls.

Ault, Crawford and Jeffrey (1972) examined the visual scanning strategies of nine year-olds by counting eye movements as they performed a MFFT-like task. They found that reflective and fast-accurate subjects (those subjects below the median on RT and also on E's) were more systematic and made a greater proportion of these comparisons than impulsive and slow-inaccurate subjects (those above the median on RT and E's).

Erickson (1972), using kindergarten boys and girls, administered the MFFT and two word recognition tasks involving intra-list similarity.

> The data indicated that although the high similarity word list took many more trials to learn and tended to enhance the word recognition skill of reflective children more than

> impulsive children, it did not clearly provide a significantly better payoff in word recognition skill than the similar word list. (p. 3)

Kagan (1965b) gave the HVM, DRT, and MFFT to each of 130 end of first grade children and again at the end of the second grade. At the end of the first grade, he administered the Vocabulary and Information subtests from the Verbal section of the WISC. He also gave a reading type measure in which he recorded errors made as the subject read the letters of the alphabet from a random list of cards with the letters on them. A word recognitive task was administered where the examiner read to the subject one word in a five-word array on a card and the subject picked it out. Response times and errors were recorded.

At the end of grade 2 he administered the MFFT again and each subject was given a paragraph to read to the examiner. Ten error types were recorded. In summary, Kagan (1965b) states:

> Children who were impulsive, in contrast to reflective in the selection of response alternatives in design matching tests (i.e. made many errors and displayed fast decision times) made more recognition errors in reading English words presented singly or in a prose selection. The relation between fast decision times and reading errors was better for high verbal then for low verbal subjects. The measures of impulsivity on design matching tests gathered in grade one were positively correlated with reading errors one year later, with fast response times being the better predictor for boys and with high error scores being the better predictor for girls. It was suggested that the child's tendency to make fast decisions in problems with response uncertainty is a determinant of quality of reading performance, and remedial programs in reading should acknowledge the relevance of this disposition. (pp. 627-628)

In summary, no study has focused on the aided reading comprehension variables used in the present study in relation to MFFT variables. Other studies have dealt primarily with word attack skill. When intel-

ligence is controlled, what is the relationship between the WTRSD-B-C and the MFFT-E and MFFT-RT? Also of interest to the author in the present study is the relationship between MFFT-E, MFFT-RT and CEFT scores as they relate to each other. Do the MFFT and CEFT overlap in the variables which they measure?

Intelligence

Belmont and Birch (1966), in a very complete summary of intelligence, as measured by the WISC, and its relation to reading retardation, emphasized the significant correlations between reading difficulties and the Verbal scale of the WISC. Retarded readers did better on the Performance section (WISC-P) and little difference was found in terms of WISC-FS. This lends support to the fact that reading is largely a language-related function, rather than primarily a perceptual-related function. This is especially true of reading comprehension skills and of the aided reading comprehension measures utilized in the present study. Most correlation coefficients reported in the literature range from .4 to .7 in terms of the relationship between intelligence and reading skills.

Some mention has been made of the relationship between the various cognitive style measures and the variables measured by intelligence tests. In terms of the SCST, Sigel, Jarman and Hanesian (1963) found that for high test-anxious children, performance on intelligence is influenced by the Categorical-Inferential (CI) categorization style. Scott (1972) found no significant correlation between intelligence and the use of CI responses or between intelligence test and achievement scores in

science. He found that cognitive style (style of conceptualization) was a better predictor of a science concept test than the intelligence measure. Summarizing the relation between intelligence measures and the WISC test philosophy of scoring, Annesley (1971) found support for the idea that intelligence test results are a function of cognitive style.

In terms of the MFFT and intelligence, the relationship is not at all clear. Kagan, et al., (1964, Study 2) found that WISC-V scores are not related to MFFT-E and MFFT-RT scores. They did find some low negative correlations between MFFT-E, HVM and DRT and IQ as measured by the California Test of Mental Maturity but not with MFFT-RT's. Kagan, Pearson and Welch (1966a) found a negative correlation between MFFT and HVM and WISC-V but RT scores were independent of WISC-FS. Meichenbaum and Goodman (1969), utilizing the Primary Mental Abilities Tests, Ward (1968), utilizing the Peabody Picture Vocabulary Test, and Lewis, Rousch and Goldberg (1968), utilizing the Stanford-Binet, all found somewhat confusing and inconsistent results. Nelson (1972) suggests two reasons why this occurs. First, the conceptual tempo-IQ relationship is dependent on the nature of the test used. Secondly, most cognitive style tests are utilized with younger children. Intelligence measures, especially those which are short-forms, picture oriented and group administered are relatively less reliable than a longer more complete measure like the WISC or Stanford-Binet. The WISC was selected for the present study because it controls for some of the variability found in other measures, even though it takes longer to administer.

The early work of Witkin, et al. (1962) dealt with a factor called an Analytic or Perceptual Index. It is comprised of three subtests of the WISC-P (Block Design, Picture Completion and Objective Assembly). Much of the factor analytic work by Thurstone (1944, 1949) and Witkin, et al. (1962 pp.66-68) led to a view of intelligence as a wide variety of skills which could be divided into three factors: verbal comprehension, attention-concentration and analytic field approach. This latter factor was found to relate to the EFT and other disembedding tasks. As one looks at the various intercorrelations between those intelligence or thinking variables, or perhaps, skills which are utilized in comprehending spoken and written language, the question arises as to their relationship to cognitive style variables like the CEFT, the MFFT, the SCST, and the Wisconsin Tests for Reading Skill Development-Level B-Comprehension. For that reason the WISC-AI was included in the present study. If thinking involves a wide variety of skills, which of these are similar to, if not the same, as specific cognitive styles? And then, how do these styles relate to those aided reading comprehension variables implicated in our understanding of the reading processes and conceptual models?

Comprehension

Reviews of the early work in reading comprehension generally start with the work of Thorndike (1917) and proceed through the work of Richards (1929), Berry (1931), Dewey (1935), Feder (1938), Traxler (1941) and Harris (1948). These correlational studies began to explore the

various components of comprehension working on the understanding that reading comprehension is not a unitary process. Davis' (1944) major factor analytic study of comprehension dealt with nine factors though these were reduced somewhat in a later factor analytic study (Davis, 1968). In the latter study he found that the largest percentage of unique variance clusters on a skill called "memory for word meaning". The next largest percentage of unique variance was referred to as "drawing inferences from context". Other skills, in order, included "following the structure of the passage"; "recognizing a writer's purpose, attitude, tone and mood"; and "finding answers to questions asked explicitly or in paraphrase".

Chester (1971), Smith (1970) and Davis (1972) outline in some detail the growing trend of a multi-skill theory of comprehension. While all skills involved in comprehension may not be measureable or even identifiable, those which can be measured and dealt with by teachers in practice are focused upon by those selected in the Wisconsin Tests for Reading Skill Development-Comprehension. The five skills measured by the WTRSD-B-C are based on historical, empirical and logical importance. The literal and inferential skills dealt with seem most related to the kinds of skills measured by intelligence variables and, perhaps, those variables referred to in the present study as cognitive style. While considerable further study will be required in order to deal with reading comprehension measures which are not aided (orally read to subject), the WTRSD-B-C tests do provide a logical and natural tie between listening comprehension and reading comprehension. They also provide a clear focus on aided

reading comprehension skills by controlling for the wide variability in various word attack skills in first grade subjects. In fact, nearly the same WTRSD-B-C tests are given at Level C in the sequence except that the items are not read to the subject. Reliability coefficients and additional details on the selection of the WTRSD-B-C are reported in Chapter 2. Directions and sample items of the tests appear in Appendices D-H.

CHAPTER 2

METHOD

Subjects

Subjects were selected from first grade classes in one school in each of two cities in Southern Wisconsin with populations of less than 5,000. In one school a complete classroom of 25 subjects (10 boys, 15 girls) was utilized, in the other, six students were randomly picked from each of two classrooms with a combined total of 50 students. The total sample size, then, was 37 subjects (16 boys, 21 girls). It was found that three of the boys (one from the first school and two from the second) had previously been referred for psychological testing and had been given part or all of the WISC. In order not to introduce inter-tester variability with regard to the WISC, it was decided to drop these three subjects. The final sample, then, consisted of 34 subjects (13 boys, 21 girls).

The sample represented a wide range of socio-economic levels and classifications ranging from low to upper-middle classes. All subjects were Caucasian. One female subject was from a bilingual home.

Subjects were all first graders with a mean age of 87.3 months (SD = 4.6 months) at the time of the testing during May. WISC Full Scale Intelligence scores ranged from 89 to 142, with a mean score of 112.1

and a standard deviation of 12.3. Additional descriptive data are discussed in Chapter 3 as each of the 16 variables is examined.

Procedure

The first tests given to each subject were those dealing with cognitive styles: the Children's Embedded Figures Test (CEFT), the Matching Familiar Figures Test (MFFT), and the Sigel Cognitive Styles Test (SCST). Each of these was randomly rotated with each subject. The author gave two tests and usually the third in one sitting unless it appeared that fatigue or attention span would affect the performance. All three tests were administered by the author to one subject at a time. This testing was done in small familiar rooms near the subjects' classroom. As with all the other measures, testing was scheduled so that it did not interfere with recesses, noon breaks or special class activities. Administration time for all three of these measures together varied from 30 to 60 minutes.

The next test administered to each was the Wechsler Intelligence Scale for Children (WISC). A qualified psychometrist, assisting the author, gave and interpreted all 34 of these tests. The testing took place under conditions identical to those described for the cognitive style measures. Administration time varied from about 30 to 60 minutes. Once the individual testing was completed in each school, the five aided reading comprehension tests comprising the Wisconsin Tests for Reading Skill Development, Level B-Comprehension (WTRSD-B-C) were given in two settings to the entire group in each school. The author read each item to the group while they read it silently to themselves or followed along.

The psychometrist assisted by making sure each subject understood the task and marked a response for each question. In the school with 25 subjects at a sitting, the classroom teacher also assisted the psychological examiner. In each school, three subjects missed one of the group testing sessions. In these cases the author gave the missed tests individually. The first sitting, involving the WTRSD-B-C, Tests 1-3, took approximately 40 minutes. The second sitting, involving the WTRSD-B-C, Tests 4-5, took approximately 30 minutes. The group testing occurred in the classroom of the 25 subjects in one school and in a familiar classroom in the second school.

Instruments

Children's Embedded Figures Test

The CEFT (Karp and Konstadt, 1971) was administered individually by the author. The task involves finding a small "tent" and "house" shaped figure in a larger more complex picture. Directions and an example of the CEFT items are included in Appendix A. There are 25 possible items and the subject's score is the number correct. The higher the score, the more field independent the subject. In classifying the subjects, the median score is used. Those above the median are classed as field independent; those below the median are classed as field dependent.

The CEFT was standardized on 160 randomly selected children ranging from 5-12 years of age in two Brooklyn, New York schools with a wide variety of ethnic, religious and racial groups. Witkin, Ottman, Raskin and Karp (1971) report a significant age effect with subjects becoming

more field independent. Age and sex interactions were not significant. Internal consistancy reliability estimates ranged from .83 to .90 for 7-8 year old subjects. These were consistent with similar CHEF studies estimates found for 9-10 and 11-12 year old subjects. A test retest correlation of .87 was also reported for 5 year old children retested 5-6 months later. These reliability correlation relate favorably to those reported for the EFT.

A wide variety of validity coefficients are also reported in Witkin, Ottman, Raskin and Karp (1971). Because the EFT is too difficult for younger children comparisons with CEFT are difficult to make. Validity coefficients for 11-12 year old subjects ranged from .83 to .86. CEFT-EFT product moment coefficients for 9 year old subjects ranged from .70 to .73. When correlated to account for reliability, the validity coefficients at age nine reached .80. Face validity, high EFT-CEFT validity coefficients and the significant age effect suggest that the CEFT is an adequate measure of field dependence at this age level.

Sigel Cognitive Style Test

The SCST, Forms M and F (Sigel, 1967) measure the style of categorization a subject employs when asked to select pairs of figures from a series of plates with three familiar figures on each and state the reason for the choice. See Appendix B for directions and an example of the items. These reasons are then classified as Descriptive Part-Whole (DPW), Descriptive Global (DG), Relational-Contextual (RC) and Categorical-Inferential (CI). Each of these categories is described in Chapter 1. Scores recorded for purposes of analysis were the percent of total responses in each of these categories. As in the Serafica and

Sigel (1970) study, several of the responses in the present study could not be classified as one of the four mentioned above (DPW, DG, RC, or CI). A "negative" classification was used to denote a response which referred to a pair explicitly selected as not being like the third one (eg., This one and this one are not round like the third one). A "disjunctive" classification was used to denote a response in which differences in the chosen pair were explicitly stated (eg., This one is black and this one is white).

Reliability studies dealing with the SCST are reported in a variety of studies. Annesley (1971), in a pilot study for his main study, found 80% test and retest agreement on overall mean percent agreement after 10 days. Kagan, et al. (1964) reported a corrected split-half reliability coefficient of .94 based on 300 protocols. This was based, however, on DPW responses only. Scott and Sigel (1965) reported odd-even coefficients ranging from .45 to .83 for the range of six subcategories with a .71 coefficient for the overall test. Scott (1971) analysed the 35 original SCST stimulus cards in elementary schools and found that both boys and girls answered some plates in the same way. In order to improve reliabilities he created one form for boys with 20 plates and one form for girls with 16 items. Resulting split-half reliability coefficients for the girls on the overall test were .85 and for boys the overall test coefficient was .63. Given to a group of high school boys and girls, the resulting split-half coefficients were .74 and .81 respectively. Davis (1971) administered a shorted group version of the SCST to fifth, eighth, and eleventh grades and college subjects. Mean test-retest reliability coefficients of .66 and .63 were reported for response fre-

quencies and percentages, respectively. He also noted that there were no sex differences and that the four grade levels yielded developmental trends inconsistent with previous studies. Basically his concern centered around the fact that the use of total response frequencies based on unlimited free responses. In the present study, percentages of the four response categories are used and a frequency percentage pattern analysis procedure is suggested to deal with this problem.

Matching Familiar Figures Test

The MFFT (Kagan, 1965a) measures a subject's response time (RT) and number of errors (E). The tasks involve selecting 12 figures from 12 arrays of six similar figures. Those subjects scoring above the median in terms of total errors and below the median in terms of average response times are classified as Implusive. Conversely, those subjects with fewer errors and longer response times are classified as Reflective. For specific directions and an example of an item, see Appendix C.

In terms of reliability studies, Yando and Kagan (1968) found RT for first grade girls to be stable (.70), but lower for boys over a 9 month period. Messer (1970) found significant test-retest correlations for first grade boys 2-1/2 years later. Siegelman (1969) found a test-retest correlation of .73 for 4th grade boys over a short period of time. Yando and Kagan (1969) found test-retest reliability coefficients for second grade children over a 10 week period of .68 ($p < .01$) for errors and .73 ($p < .01$) for response time. Kagan (1965b) found similar results for both boys and girls tested at the end of first grade and again at the

GPO 804-830-3

end of second grade.

In terms of validity correlations Messer (1970) found significant coefficients between HVM and MFFT in first graders. These results were substantiated by Kagan, Pearson, and Welch (1966) and Kagan (1966). Kagan, et al. (1964) found positive correlations between DRT, HVM, and MFFT for third graders.

Wechsler Intelligence Scale for Children

The WISC was individually adminstered in a standard fashion to each subject and scored by a qualified psychological examiner according to the WESC manual (Wechsler, 1949). Three scores were recorded: Full Scale, Verbal and Performance. The scores were based on the following subtests:

Verbal	Performance
General Information	Picture Vocabulary
General Comprehension	Picture Arrangement
Arithmetic	Block Design
Similarities	Object Assembly
Vocabulary	Coding

In this study, an additional score, Analytic Index, was derived. This score is a composite of the scaled scores derived from three WISC subtests: Block Design, Object Assembly and Picture Completion. This measure has been found to correlate substantially with the field dependence-independence variable (Goodenough and Karp, 1961 and Witkin et al., 1962) as discussed in Chapter 1, page

Adequate reliability and validity coefficients for the WISC have been widely reported and recognized (Nunnally, 1959). While some questions have been raised in the literature about the validity of the WISC with various ethnic and socioeconomic groups, it should be pointed out

that the present sample included 33 white children and closely matched the urban-rural and parental occupation ratios reported in the standardization data.

Wisconsin Tests of Reading Skill Development, Level B-Comprehension

The WTRSD-B-C is a set of five aided reading comprehension tests which were given in two settings to the entire group of subjects in each school. As discussed in Chapter 1, these tests were developed by the Wisconsin Design for Reading Skill Development staff at the Wisconsin Research and Development Center for Cognitive Learning at the University of Wisconsin-Madison.

This set of competency based aided reading comprehension instruments measures five specific skills:

> Test 1--Paragraph Topics. The subject identifies the topics of paragraphs. Topics are expressed as single words or as phrases.
>
> Test 2--Before or After. After hearing a four-event story, the subject selects the picture that shows what happened either just before or just after the event specified by the examiner.
>
> Test 3--Outcomes. The subject selects the one of four pictures that shows the action likely to follow a three-part event described in a sentence read to him by the examiner.
>
> Test 4--Cause-Effect. The subject indicates whether pairs of events are causally related.
>
> Test 5--Detail. The subject answers questions about stories. The questions require the subject to identify specific nouns, adjectives and verbs as well as antecedents of pronouns. (Otto, 1973, p.4)

In Tests 1, 4 and 5 the author read each item to the group while they read it silently to themselves. In Tests 2 and 3, the author read each item to the group while they examined sets of either three or four

drawings. Directions and an example of the items in each of the five tests are included in Appendices D-H. General theoretical and empirical support for the five skills measured are discussed in Chapter 1.

While data are still being collected on the Comprehension section of the Wisconsin Design for Reading Skill Development, the reliability and validity estimates appear to be well within acceptable ranges. In terms of inter-test correlation, Table 1, based on N = 279, is offered.

TABLE 1.

INTER-TEST CORRELATIONS OF THE WTRSD-B-C AND TOTAL WORD ATTACK SKILLS

TEST	1	2	3	4	5	6
1. Word Attack	---					
2. Paragraph Topics, Form I	.567	---				
3. Before or After	.493	.506	---			
4. Outcomes	.435	.401	.544	---		
5. Cause-Effect, Form I	.474	.394	.517	.532	---	
6. Detail, Form I	.584	.495	.555	.522	.497	---

Stewart (1973), in a personal communication, pointed out that the intercorrelation coefficients in Table 1 and the following estimated internal-consistency reliability coefficients "were obtained from reruns of data with some test items omitted" and are to be considered as "preliminary data only." She goes on to say that "although we have found that our estimates tend to work well, you must be aware of their limitations." Reported estimated internal consistency reliabilities are: Main Idea, Form I, .87; Sequence, .69; Outcomes, .80; Cause-Effect, Form I, .73; and Detail, Form I, .84.

TABLE 2.

DESCRIPTIVE STANDARDIZATION DATA[1]
INCLUDING THE PRESENT SUBJECT POOL[2]

TEST	N. OF ITEMS	MEAN RAW S	MEAN %	MASTERS[3] N	MASTERS[3] %
1. Main Idea	30(15)	21.49(13.24)	71.6(88.3)	115(30)	50.0(88.2)
2. Sequence	12(12)	8.26(9.21)	68.8(76.8)	76(17)	33.0(50.0)
3. Outcomes	12(12)	6.37(7.59)	53.1(63.3)	49(12)	21.3(35.3)
4. Cause-Effect	26(24)	20.12(19.26)	77.4(80.3)	79(21)	59.0(61.8)
5. Detail	40(20)	29.71(15.35)	74.3(76.8)	103(20)	44.8(58.7)
			Total	126(7)	54.8(20.6)

1--N = 230
2--N = 34
3--This term applies to those students who have scored 80% or better on one of the WTRSD tests as outlined in the Rationale and Guidelines of the Wisconsin Design for Reading Skill Development by Wayne Otto and Eunice Askov, 1970.

Standardization studies of the WTRSD-B-C are summarized in Table 2. Data from the present study are in parentheses so that data from both groups can be compared.

Scoring

The CEFT, MFFT and SCST were all hand scored and summarized by the author. The CEFT and MFFT are straightforward in their scoring. The subject either finds the embedded form on the CEFT or he doesn't. The same is true on the MFFT and, in addition, a stop watch is used to measure response time.

The SCST requires a certain amount of judgment in that once the subject selects various pairs of figures and gives a reason for that choice the reasons must be classified into four categories by standards

set out in Sigel (1967). For that reason three intact and unused protocols were scored independently by the author and two other raters who were not involved in the study. One rater had nearly completed and one had just completed a doctoral degree in Reading at the University of Wisconsin-Madison. Results of the interrater agreement are summarized in Table 3. Sufficient agreement was found to place adequate confidence in the author's scoring of the SCST.

TABLE 3.

INTERRATER AGREEMENT BETWEEN THREE JUDGES ON CLASSIFICATION OF RESPONSE ON THE SCST

	TOTAL RESPONSES	DISAGREE	AGREE	% AGREEMENT
Test A	89	5	84	94.4%
Test B	113	6	107	94.7%
Test C	41	1	40	97.6%
Total	243	12	231	95.1%

When these results are interpreted utilizing a cumulative binomial distribution, they indicate that a total percentage agreement of this magnitude (95.1%) significantly differs from chance ($p < .10^{-9}$).

As mentioned earlier, all WISC protocols were administered and interpreted by a trained psychometrist. Four scores were obtained: WISC Full Scale, WISC Verbal, WISC Performance and the AI which is the total scaled scores from the Block Design, Object Assembly and Picture Completion subtests.

The WTRSD-B-C, tests 1-5, were handscored by the author using the straightforward directions outlined in the Test Adminstrator's Manual, Level B (Otto, 1973).

Data Analysis

As outlined in the Statement of the Problem section of Chapter 1, the author used 10 sets of questions to examine the intercorrelations between field dependence-independence, styles of categorization, reflectivity-impulsivity, four intelligence variables and five aided reading comprehension variables. To that end, 16 variables from the SCST, CEFT, MFFT, WISC and WTRSD-B-C were included on three intercorrelation matricies: one for males, one for females and a combination of both. In order to examine the relationship between the cognitive style variables (SCST, CEFT and MFFT) and the aided reading comprehension variables (WTRSD-B-C, Tests 1-5) with intelligence (WISC-FS) controlled, three sets of partial correlations were run.

Since research in the area of cognitive style, and, in this case, the WTRSD-B-C, is still formative, the level of significance accepted in this study is .10. The degree of the levels of significance for correlation coefficients obtained from the intercorrelation of cognitive style, intelligence and aided reading comprehension measures are important in analyzing the present data with regard to other studies in the literature. Therefore, in the present study all correlation coefficients of $p < .10$ and above are reported in the Tables and discussions in Chapters 3 and 4.

CHAPTER 3

RESULTS AND DISCUSSION

Sixteen variables derived from the Children's Embedded Figures Test (CEFT), the Sigel Cognitive Styles Test (SCST), the Matching Familiar Figures Test (MFFT), the Wisconsin Intelligence Scale for Children (WISC), and the Wisconsin Tests for Reading Skill Development, Level B-Comprehension (WTRSD-B-C) were intercorrelated using the DSTATZ Program in the STATJOB SYSTEM maintained by the Madison Academic Computing Center. Partial correlations and their levels of significance were computed utilizing procedures outlined by Hays (1963, pp. 530-31, 574-76). Descriptive data on each of the above five tests are presented followed by a discussion of the intercorrelational data as they pertain to each of the 10 questions raised in the present study.

Descriptive Data

Children's Embedded Figures Test

The ranges, means and standard deviations of the 21 females and 13 males in the study are summarized in Table 4. Witkin, Oltman, Raskin and Karp (1971) present similar means and standard deviations for their 7-8 year old age group: male, 11.4 and 6.2; female, 9.8 and 4.8; and total, 10.6 and 5.6. Watson (1969) also found similar results with 25 first grade boys: range, 3-21; mean 11.16 and standard deviation 4.90.

TABLE 4.

SUMMARY OF CEFT RANGES,
MEANS AND STANDARD DEVIATIONS

	RANGE	MEAN	SD
Male	4-22	11.077	5.499
Female	3-18	10.381	4.620
Total	3-22	10.647	4.904

Sigel Cognitive Styles Test

The ranges, means and standard deviations for each of the four major styles of categorization percentages for males and females on the SCST are summarized in Table 5. These styles include: Descriptive Part-Whole (DPW), Descriptive Global (DG), Relational-Contextual (RC), and Categorical-Inferential (CI). Negative and Disjuctive response percentage ranges and means are also presented though they comprise a substantially smaller percentage of total responses. Females had a higher percentage of DG responses, while males had a higher percentage of RC responses. Considerable variability was found with RC response percentages for both males and females. No norms were reported by the author (Sigel, 1967). No data were found describing first grade student performance on the SCST.

Matching Familiar Figures Test

The ranges, means and standard deviations for the two variables measured by the MFFT, response time (RT) and errors (E) are summarized

TABLE 5.

SUMMARY OF SCST CATEGORY
PERCENTAGE RANGES, MEANS AND
STANDARD DEVIATIONS

		RANGE	MEAN	SD
DPW%	Male	8.70-85.37	41.600	25.938
	Female	13.04-86.30	43.743	22.115
	Total	8.70-86.30	42.924	23.284
DG%	Male	0-35.71	11.062	10.688
	Female	1.37-42.86	16.843	9.914
	Total	0-42.86	14.632	10.452
RC%	Male	0-65.22	13.100	17.063
	Female	0-29.41	8.371	9.702
	Total	0-65.22	10.179	12.975
CI%	Male	14.63-55.77	30.169	12.306
	Female	6.56-55.56	28.586	13.521
	Total	6.56-55.77	29.191	12.903

in Table 6. No sex differences were found with either MFFT or MFFT-E. All subjects were classified as being either Reflective, those falling above the MFFT-RT median and below the MFFT-E median, or Impulsive, those falling below the MFFT-RT median and above the E median. Reflective subjects (N = 11) had a mean MFFT-RT of 18.17 and a mean MFFT-E of 7.09; while Impulsive subjects (N = 12) had a mean of 8.13 and 19.00 respectively. These mean scores for Reflective and Impulsive subjects are similar to those reported by other studies examining first grade subjects (Kagan, 1965a; Yando and Kagan, 1968; Kagan, Pearson and Welch, 1966b).

TABLE 6.

SUMMARY OF MFFT RANGES,
MEANS AND STANDARD DEVIATIONS

		RANGE	MEAN	SD
RT	Male	6.96-30.00	14.354	7.130
	Female	4.67-24.25	11.629	5.188
	Total	4.67-30.00	12.671	6.050
E	Male	6-29	13.615	7.205
	Female	5-21	13.143	4.597
	Total	5-29	13.324	5.634

Wechsler Intelligence Scale for Children

The ranges, means and standard deviations of the four variables derived from the WISC are summarized in Table 7. These variables include: Full Scale (FS), Verbal (V), Performance (P) and the Analytic Index (AI). No substantial differences between males and females were apparent in any of the four measures, except for the WISC-V in which the males' mean is somewhat higher than the females' mean.

Wisconsin Tests for Reading Skill Development, Level B-Comprehension

The ranges, means and standard deviations of the five tests included in the WTRSD-B-C are summarized in Table 8. The tests include: Paragraph Topic (PT), Before or After (BA), Outcomes (O), Cause-Effect (CE), and Detail (D). No sex differences were apparent for any of the five measures. Comparisons of the present sample to that used in standardizing the WTRSD-B-C were presented earlier in Table 2 (Chapter 2).

Questions

Through the analysis of the data, 10 questions were examined in the present study. Each of the questions is discussed in order.

1. a. To what degree is field dependence-independence (CEFT) associated with performance of the following aided reading comprehension skills (WTRSD-B-C)?

   1) Identifying a paragraph topic (WTRSD-PT)

   2) Determining sequence (WTRSD-BA)

   3) Using logical reasoning in predicting outcomes (WTRSD-O)

   4) Using logical reasoning in synthesizing information (WTRSD-CE)

TABLE 7.

SUMMARY OF WISC RANGES,
MEANS AND STANDARD DEVIATIONS

		RANGE	MEAN	SD
FS	Male	100-142	114.38	11.67
	Female	89-138	110.62	12.69
	Total	89-142	112.06	12.27
V	Male	97-138	112.62	10.63
	Female	82-135	105.00	14.05
	Total	82-138	107.91	13.22
P	Male	97-139	113.54	12.29
	Female	89-135	114.90	12.29
	Total	89-139	114.38	12.12
AI	Male	25-52	37.85	7.34
	Female	25-48	36.00	6.61
	Total	25-52	36.71	6.85

TABLE 8.

SUMMARY OF WTRSD-B-C RANGES,
MEANS AND STANDARD DEVIATIONS

		RANGE	MEAN	SD
PT	Male	4-15	13.154	2.911
	Female	3-15	13.286	2.795
	Total	3-15	13.235	2.796
BA	Male	4-12	9.308	2.496
	Female	5-12	9.143	1.852
	Total	4-12	9.206	2.086
O	Male	2-11	6.692	3.401
	Female	4-11	8.143	2.287
	Total	2-11	7.588	2.808
CE	Male	11-24	19.154	4.705
	Female	10-23	19.333	4.487
	Total	10-24	19.265	4.501
D	Male	10-20	14.462	3.455
	Female	5-20	15.905	3.604
	Total	5-20	15.353	3.567

5) Reading for details (WTRSD-D)

b. To what degree is field-dependence-independence (CEFT), with total intelligence (WISC-FS) controlled, associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

TABLE 9.

INTERCORRELATION SUMMARY OF CEFT AND WTRSD-B-C

	WTRSD-B-C				
	PT	BA	O	CE	D
Male	.306	.314	.224	.128	.520(.068)
Female	.080	.309	.217	.346	.612(.003)
Total	.174	.312(.071)	.194	.250	.544(.001)

Level of significance, two-tailed, for $p < .10$ is listed in parentheses following each coefficient.

The intercorrelation between the CEFT and each of the five measures from the WTRSD-B-C are summarized in Table 9. Significant correlation coefficients were found between the number of correct responses on the WTRSD-D and CEFT for males, females and total subjects. This implies that the more field independent a subject is, the better his ability to focus on and recall details from a paragraph. However, when intelligence (WISC-FS) was controlled, this was not found to be the case with male subjects. This partial correlation coefficient, with WISC-FS controlled, for females was .611 ($p < .01$) and, for the total sample, was .480 ($p < .01$). Another significant relationship, ($p < .071$), was found for the total sample between the CEFT and the WTRSD-BA; how-

ever, the coefficient was not significant when intelligence (WISC-FS) was controlled.

Watson (1969) found a significant ($p < .01$) correlation coefficient of .57 for first grade boys on the CEFT and Stanford Achievement Test-Paragraph Meaning subtest. Intelligence was not controlled. In the present study a significant coefficient ($p < .068$) of .520 was found between WTRSD-D and CEFT when intelligence was not controlled. The specific comprehension skills measured by the SAT-Paragraph Meaning are not clear; however, selectively attending to details appears to be one of them.

Cohn (1968), found that, for sixth grade males and females, significant positive relationships existed between the EFT and four tests of the Sangren - Woody Reading Test: Details ($p < .05$), Main Idea ($p < .01$), Sequence ($p < .01$) and a Total score ($p < .05$). In the present study, similar results were found using the CEFT and the WTRSD-D ($p < .001$), WTRSD-BA, which measures sequencing skills, ($p < .071$). The WTRSD-PT test measures those skills most highly related to those usually described as finding the main idea. Eighty-eight percent of the subjects in the present sample were masters of the WTRSD-PT, therefore, one can neither question nor support Cohn's findings with regard to identifying the main idea in a story. In general, similar results were found between skills implicated in reading comprehension and field dependence-independence for first grade and sixth grade subjects.

2. a. <u>To what degree is reflection-impulsivity (MFFT-E, MFFT-RT) associated with performance of the aided reading comprehension skills cited previously 1) through 5)</u>?

b. To what degree is reflection-impulsivity (MFFT-E, MFFT-RT), with total intelligence controlled, associated with performance of the aided reading comprehension skills cited previously 1) through 5)?

The intercorrelations between the MFFT-RT (average response time) and MFFT-E (errors) variables and the five aided reading comprehension measures from the WTRSD-B-C are summarized in Table 10. No significant correlation coefficients were found for the MFFT-RT variable with either male or female subjects. However, four significant negative coefficients were found between MFFT-E and WTRSD-D (finding details): Males ($p < .027$), females ($p < .006$) and total sample ($p < .001$). When intelligence (WISC-FS) was controlled, only the significant correlation coefficients between WTRSD-D and MFFT-E for females and total sample remained significant ($p < .01$). These results are consistent with those found for Question 1, which indicated a significant relationship between CEFT and WTRSD-D. The similarity between the CEFT and MFFT-E performances are discussed with the results related to Question 10. Another significant relationship ($p \leq .077$) was found for the total sample between MFFT-E and WTRSD-O (predicting logical outcomes); however, when intelligence (WISC-FS) was controlled, the relationship was not significant.

Yando and Kagan (1968) found that a significant relationship existed between MFFT-E and the Metropolitan Reading Readiness Test for first grade male and females subjects. In their study intelligence was not controlled. These results were confirmed by findings of the present study. Yando and Kagan (1968) also found a significant relationship between MFFT-RT and the CEFT for first grade females. Other studies have reported significant relationships between reflection-impulsivity,

GPO 804-830-4

TABLE 10.

INTERCORRELATION SUMMARY OF
MFFT AND WTRSD-B-C

	WTRSD-B-C				
	PT	BA	O	CE	D
MFFT-RT					
Male	.116	.217	-.137	.283	.358
Female	-.080	-.154	.309	-.065	.229
Total	.005	.049	.003	.089	.224
MFFT-E					
Male	-.072	-.178	-.359	-.109	-.605(.027)
Female	.012	-.085	-.235	-.119	-.573(.006)
Total	-.030	-.135	-.307(.077)	-.112	-.567(.001)

Level of significance, two-tailed, for $p < .10$ is listed in parentheses following each coefficient.

various word attack skills, and word learning tasks (Erickson, 1972; Kagan, 1965b). Visual scanning (Ault, Crawford and Jeffrey, 1972) has also been shown to be affected by one's disposition toward either reflection or impulsivity. The present study shows that even when dependence on the visual variables is controlled to some degree, the MFFT-E variable is significantly related to some aspects of aided reading comprehension in male and female first grade subjects, even when, in the case of females, intelligence is controlled.

3. a. To what degree is style of categorization (SCST-DPW, SCST-DG, SCST-RC, SCST-CI) associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

   b. To what degree is style of categorization (SCST-DPW, SCST-DG, SCST-RC, SCST-CI), with total intelligence (WISC-FS) controlled, associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

The intercorrelations between the WTRSD-B-C and the percentage of total responses on the SCST for each of the four major response categories are summarized in Table 11. These categories include: Descriptive Part-Whole (DPW), Descriptive Global (DG), Relational-Contextual (RC) and Categorical-Inferential (CI). Each of these categories is described in Chapter 1. None of the interrelationships was significant for male subjects and only two were significant for females: WTRSD-PT (finding a paragraph topic) and SCST-DPW percentage, ($p < .040$) and WTRSD-O (predicting outcomes) and SCST-CI percentage, ($p < .061$). Of these two interrelationships, only the WTRSD-PT and SCST-DPW percentage coefficient was significant ($p < .10$) when intelligence (WISC-FS) was controlled.

TABLE 11.

INTERCORRELATION SUMMARY OF
SCST AND WTRSD-B-C

	WTRSD-B-C				
	PT	BA	O	CE	D
SCST-DPW%					
Male	.377	-.004	.268	-.152	-.254
Female	-.449(.040)	-.195	-.179	.107	.335
Total	-.099	-.103	.059	-.002	.105
SCST-DG%					
Male	-.061	.062	-.220	.237	.374
Female	.307	.306	-.054	.167	-.006
Total	.159	.173	-.055	.193	.186
SCST-RC%					
Male	-.257	.067	-.260	-.035	-.074
Female	.187	-.068	-.036	-.156	-.348
Total	-.048	.018	-.209	-.091	-.229
SCST-CI%					
Male	-.456	-.193	-.111	.094	.108
Female	.349	.125	.414(.061)	-.180	-.187
Total	.056	-.007	.152	-.081	-.096

Level of significance, two-tailed, for $p < .10$ is listed in parentheses following each coefficient.

As pointed out in Chapter 2, Davis (1971) raised questions regarding the use of raw score frequencies based on unlimited free responses. In the present study, percentages of responses by category were used. While one interpretation of the results presented in Table 2 might center around the lack of interrelationship between the skills being measured on the two tests, a second interpretation is also possible. It has been pointed out that few subjects have a consistent specific categorical response, such as Descriptive Part-Whole or Relational-Contextual, which yields over 50 percent of his responses in the SCST (Davis, 1971). Following a conversation with Dr. Sigel, Davis (pp. 1456-1457) suggested that a more valid utilization of the SCST may be to look at "patterns of responses."

The present author developed some descriptive tables which appear to be useful in analyzing SCST response patterns as they relate to the other variables examined in this study. Of the 24 possible combinations of the SCST-DPW percentage, SCST-DG percentage, SCST-RC percentage and SCST-CI percentage, variables ranked in order from highest to lowest percentages, only 14 combinations were utilized by subjects in the present study. The frequency of each of these response patterns is given in Table 12. Special note should be taken that in many cases the subject had tied percentages of two of the four SCST categorical response types. In these cases each of the two resulting response patterns are presented.

The frequency distributions of SCST response patterns as they relate to the WTRSD-B-C, WISC-FS, and WISC-AI are summarized in Tables 13-15. The number of these tied response patterns are listed in each table. Because of the low frequencies of various SCST response patterns and the

TABLE 12.

FREQUENCY DISTRIBUTION OF SCST RESPONSE PATTERNS

Frequency Pattern	Male	Female	Total
DPW-CI-DG-RC	4	9	13
DPW-CI-RC-DG	5	0	5
CI-DG-DPW-RC	1	3	4
DG-CI-DPW-RC	1	2	3
RC-CI-DPW-DG	1	2	3
CI-RC-DPW-DG	0	3	3
DPW-DG-CI-RC	0	2	2
CI-DPW-DG-RC	1	1	2
CI-DG-RC-DPW	2	0	2
CI-RC-DG-DPW	1	1	2
DPW-RC-DG-CF	0	1	1
DG-DPW-CI-RC	0	1	1
DG-CI-RC-DPW	1	0	1
RC-CI-DG-DPW	0	1	1
Total	17	26	43
N	13	21	34
Ties	4	5	9

size of the present sample, 13 males and 21 females, no attempt was made to compute intercorrelation coefficients between these SCST response patterns and the other 12 variables in the present study.

The frequency of response patterns for those male and female subjects who have mastered each of the five WTRSD-B-C tests are summarized in Table 13. The first column indicates the total number of male or female subjects in the study and their response patterns. In each of the rest of the columns, are the number of subjects having mastered (correctly answered 80% of the questions) each of the WTRSD-B-C tests. The DPW-CI-DG-RC response style was the most efficient for males while the CI-DG-RC-DPW appeared to be the most effective for females in terms of the WTRSD-B-C measures. This disposition toward an analytic style in males and the inferential style in females may be tied to developmental age variables.

The frequency of response patterns by level of intelligence (WISC-FS) for males and females are summarized in Table 14. The DPW-CI-DG-RC response style was common for male and female subjects across all intelligence levels, while CI-DG-DPW-RC appears to be more related to intelligence as are those response patterns beginning with either a DG or a RC percentage.

The distribution of response patterns in terms of the WISC-AI (Analytic Index) is summarized in Table 15. Here certain response patterns tend to differentiate between inter- and intra-sex patterns. For example, the CI-RC-DPW-DG female pattern, as in other tables, appears to be associated with poorer general performance, WTRSD-B-C, WISC-FS, impulsivity and field dependence.

TABLE 13.

FREQUENCY DISTRIBUTIONS FOR SCST RESPONSE PATTERNS AND WTRSD-B-C MASTERS*

	Total N		WTRSD PT		BA		O		CE		D	
	M	F	M	F	M	F	M	F	M	F	M	F
DPW-DG-CI-RC		2		1		1				1		1
DPW-RC-DG-CI		1		1						1		1
DPW-CI-DG-RC	4	9	4	7	3	3	3	2	3	5	2	6
DPW-CI-RC-DG	5		5		2		2		2		1	
DG-DPW-CI-RC		1		1		1				1		1
DG-CI-DPW-RC	1	2	1	2	1	1			1	1	1	1
DG-CI-RC-DPW	1		1		1				1		1	
RC-CI-DPW-DG	1	2	1	2	1	2		1		2		1
RC-CI-DG-DPW		1		1		1				1		
CI-DPW-DG-RC	1	1	1	1		1	1	1	1	1	1	1
CI-DG-DPW-RC	1	3	1	3		2		2		2	1	2
CI-DG-RC-DPW	2		1								1	
CI-RC-DPW-DG		3		2		1		1		1		1
CI-RC-DG-DPW	1	1		1								
Total	17	26	15	22	8	13	6	7	8	16	8	15
N	13	21	12	18	7	10	5	7	7	14	6	14
Ties	4	5	3	4	1	3	1	0	1	2	2	1

*Mastery level for each test is set at 80%.

TABLE 14.

FREQUENCY DISTRIBUTION FOR SCST
RESPONSE PATTERNS AND WISC-FS RANGES*

	WISC-FS					
	89-107		109-116		117-142	
	Male	Female	Male	Female	Male	Female
DPW-DG-CI-RC		1		1		
DPW-RC-DG-CI				1		
DPW-CI-DG-RC	2	4		4	2	1
DPW-CI-RC-DG	2		1		2	
DG-DPW-CI-RC				1		
DG-CI-DPW-RC				1	1	1
DG-CI-RC-DPW					1	
RC-CI-DPW-DG			1	1		1
RC-CI-DG-DPW						1
CI-DPW-DG-RC			1			1
CI-DG-DPW-RC			1			3
CI-DG-RC-DPW	1		1			
CI-RC-DPW-DG		2		1		
CI-RC-DG-DPW	1	1				
Total	6	8	5	10	6	8
N	4	7	4	8	5	6
Ties	2	1	1	2	1	2

* WISC-FS Scores for N=34 divided by thirds.

TABLE 15.

FREQUENCY DISTRIBUTION OF SCST RESPONSE PATTERNS AND WISC-AI

	Male $\bar{X}$-37.8		Female $\bar{X}$-36.0		Total $\bar{X}$-36.7	
	Above $\bar{X}$	Below $\bar{X}$	Above $\bar{X}$	Below $\bar{X}$	Above $\bar{X}$	Below $\bar{X}$
DPW-DG-CI-RC				2		2
DPW-RC-DG-CI				1		1
DPW-CI-DG-RC	2	1	3	6	5	7
DPW-CI-RC-DG	3	2			3	2
DG-DPW-CI-RC				1		1
DG-CI-DPW-RC	1		1	1	2	1
DG-CI-RC-DPW	1				1	
RC-CI-DPW-DG	1		1		2	1
RC-CI-DG-DPW			1	1	1	
CI-DPW-DG-RC		1	1		1	1
CI-DG-DPW-RC	1		2	1	3	1
CI-DG-RC-DPW	1	1			1	1
CI-RC-DPW-DG				3		3
CI-RC-DG-DPW		1		1	1	1
Total	10	6	9	17	20	22
N	6	6	8	13	17	17
Ties	4	0	1	4	3	5

Although specific intercorrelation coefficients cannot be utilized in comparing the present analysis of SCST data to others used in the literature, certain trends do seem apparent. Generally, descriptive responses (DP and DG) appear to be more efficiently utilized by males then females, which has also been found by Lee, Kagan and Rabson (1963). Results of the present study are not consistent with those of Coop and Brown (1970) who found that there was no significant difference between analytic (high DPW subjects) and non-analytic (high CI subjects) in terms of total intelligence. Some support can also be inferred for Serafica and Sigel (1970) who felt that boys who could read used their analytic ability to selectively attend to specific features to help with the forming of concepts while non-readers stopped at analysis. The DPW-CI-RC-DG response pattern in Table 13 supports this inference. Support is also found in the present study for Annesley (1971) who found, with fifth grade boys, that DPW responses occurred more often with better readers.

4. To what degree is verbal intelligence (WISC-V) associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

The intercorrelations between the WISC-V (verbal intelligence score) and the five aided reading comprehension measures from the WTRSD-B-C are summarized in Table 16. Eight of the 15 possible intercorrelation coefficients were significant. The correlation coefficients for the WISC-V and the WTRSD-BA (determining sequence) were consistently significant: males ($p < .023$), females ($p < .062$) and total ($p < .006$). The paragraph topic (WTRSD-PT) was significantly correlated with the WISC-V ($p < .044$) for females and the total sample ($p < .020$). Signifi-

cant intercorrelation coefficients of ($p < .001$ and $p < .019$) were found for males and the total sample between the WISC-V and WTRSD-CE (using logical reasoning in synthesizing information). Also a significant ($p < .057$) relationship was found for males between the WISC-V and the WTRSD-D (finding details). No significant intercorrelation coefficients were found for WISC-V and the WTRSD-O (predicting outcomes). These results suggest the skills measured by the WISC-V are significantly related to several skills measured by the WTRSD-B-C, such as determining sequence as measured by the WTRSD-BA. An examination of the relationships between the four WISC measures (WISC-V, WISC-P, WISC-FS and WISC-AI) and the WTRSD-B-C is included in the discussion of Question 7.

TABLE 16.

INTERCORRELATION SUMMARY OF
WISC-V AND WTRSD-B-C

	WTRSD-B-C				
	PT	BA	O	CE	D
Male	.382	.617(.023)	.176	.787(.001)	.538(.057)
Female	.442(.044)	.413(.062)	.235	.255	.216
Total	.394(.020)	.463(.006)	.113	.399(.019)	.236

Level of significance, two-tailed, for $p < .10$ is listed in parentheses following each coefficient.

5. To what degree is non-verbal intelligence (WISC-P) associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

TABLE 17.

INTERCORRELATION SUMMARY OF
WISC-P AND WTRSD-B-C

	WTRSD-B-C				
	PT	BA	O	CE	D
Male	.431	.583(.034)	.497(.084)	.410	.618(.023)
Female	.564(.007)	.572(.006)	.579(.006)	.311	.526(.013)
Total	.513(.002)	.567(.001)	.526(.002)	.350(.042)	.558(.001)

Level of significance, two-tailed, for $p < .10$ is listed in parentheses following each coefficient.

The intercorrelation coefficients between the WISC-P (performance on non-verbal intelligence) and the five aided reading comprehension measures from the WTRSD-B-C are summarized in Table 17. As with the WISC-V, a significant relationship was found with the WTRSD-BA (determining sequence) and the WISC-P for males ($p < .034$), females ($p < .006$) and total sample ($p < .001$). The WISC-P also showed a significant relationship to the WTRSD-O (predicting outcomes) for males ($p < .084$), females ($p < .006$) and total sample ($p < .002$) as well as to the WTRSD-D (finding details), males ($p < .023$), females ($p < .013$) and total sample ($p < .001$). For females, a significant intercorrelation coefficient ($p < .007$) was found between the WTRSD-P (finding a paragraph

topic) and the WISC-P. An examination of the relationships between the four WISC measures (WISC-V, WISC-P, WISC-FS and WISC-AI) and the WTRSD-B-C is included in the discussion of Question 7.

6. To what degree is non-verbal and verbal intelligence (WISC-FS) associated with performance of the aided reading comprehension skills cited previously in 1) through 5)?

TABLE 18.

INTERCORRELATION SUMMARY OF
WISC-FS AND WTRSD-B-C

	WTRSD-B-C				
	PT	BA	O	CE	D
Male	.440	.642(.016)	.375	.632(.019)	.623(.021)
Female	.552(.009)	.543(.010)	.440(.045)	.325	.404(.069)
Total	.500(.003)	.574(.001)	.343(.046)	.428(.011)	.434(.010)

Level of significance, two-tailed, for $p < .10$ is listed in parentheses following each coefficient.

The intercorrelation coefficients between the WISC-FS (full scale intelligence) and the five aided reading comprehension measures from the WTRSD-B-C are summarized in Table 18. Twelve of the 15 possible relationships were significant. All three of the coefficients involving the WTRSD-BA (determining sequence) were significant: males ($p < .016$), females ($p < .010$) and total sample ($p < .001$). The WISC-FS also showed a significant relationship to the WTRSD-D (finding details), males ($p < .021$), females ($p < .069$) and total sample ($p < .001$).

Significant relationships between the WISC-FS and the WTRSD-PT (finding paragraph topics) included females ($p < .009$) and total sample ($p < .003$), the WTRSD-O (predicting outcomes) included females ($p < .045$) and total sample ($p < .046$) and the WTRSD-CE (using logical reasoning in synthesizing information) included males ($p < .019$) and total sample ($p < .011$). An examination of the relationships between the four WISC measures (WISC-V, WISC-P, WISC-FS and WISC-AI) and the WTRSD-B-C is included in the discussion of Question 7.

7. To what degree is the Analytic Index (WISC-P subtests: Block Design, Object Assembly and Picture Completion) associated with performance of the aided reading comprehension skills cited previously 1) through 5)?

TABLE 19.

INTERCORRELATION SUMMARY OF
WISC-AI AND WTRSD-B-C

	WTRSD-B-C				
	PT	BA	O	CE	D
Male	.512(.073)	.681(.009)	.452	.457	.542(.054)
Female	.433(.049)	.515(.016)	.394(.077)	.320	.567(.007)
Total	.458(.006)	.590(.000)	.367(.032)	.370(.030)	.513(.002)

Level of significance, two-tailed, for $p < .10$ is listed in parentheses following each coefficient.

The intercorrelations between the WISC-AI and the five measures included in the WTRSD-B-C are summarized in Table 19. Of importance here is the significant relationship ($p \leq .073$) for males between the WISC-AI and the WTRSD-PT (finding paragraph topics). None of the other WISC measures were related to this WTRSD subtest for males, while all other WISC measures were significantly related to WTRSD-PT for females including WISC-AI ($p \leq .049$). Significant coefficients existed between the WISC-AI and the WTRSD-BA for males ($p \leq .009$), females ($p \leq .016$) and total sample ($p \leq .000$), the WTRSD-D for males ($p \leq .054$), females ($p \leq .007$) and total sample ($p \leq .002$), the WTRSD-O for females ($p \leq .077$) and total sample ($p \leq .032$), the WTRSD-CE for the total sample ($p \leq .030$).

In summary, 44 of 60 correlation coefficients cited for the interrelationships between the four WISC measures and the five aided reading comprehension measures in the WTRSD-B-C with males, females and total sample were significant. All four WISC measures were significantly related to the WTRSD-D for males, females and total sample. All four WISC measures were significantly related to the WTRSD-PT for females and total sample but not for males, except in the case of WISC-AI. No significant relationships were found between the WISC-V and the WTRSD-O; however, they were found with the other three WISC measures for females and total sample. All four WISC measures correlated significantly for WTRSD-D for males and also for females and total sample with the exception of the WISC-V. All four of the WISC measures were significantly related to the WTRSD-CE for total sample only while the WISC-V and WISC-FS were significantly related to this skill with males. In general, those comprehen-

sion skills implicated in reading by the WTRSD-B-C, which are related in significant ways to the skills subsumed under intelligence as measured by the WISC, include:

1. Determining sequence or selecting from a story which of several events came just before or just after another event.

2. Identifying a topic or main idea from a story. (Primarily for females).

3. Selective attention to details and the use of memory in recalling those details.

4. Using logical reasoning in predicting story outcomes. (Primarily for females).

5. Using logical reasoning in synthesizing information in determining cause and effect. (Primarily for boys).

8. To what degree is style of categorization (SCST-DPW, SCST-DG, SCST-RC, SCST-AI) associated with field dependence-independence (CEFT)?

TABLE 20.

INTERCORRELATION SUMMARY OF SCST AND CEFT

	Male	Female	Total
SCST DPW%	-.091	.285	.110
SCST-DG%	.036	-.087	-.051
SCST-RC%	.198	-.487(.024)	-.089
SCST-CI%	-.467	-.015	-.186

Level of significance, two-tailed, for $p < .10$ is listed in parentheses following each coefficient.

GPO 804-830-3

The intercorrelations between the SCST and the CEFT are summarized in Table 20. Only one significant negative correlation coefficient ($p < .024$) was found and that was for the SCST-RC percentage of females. The more field independent the female subject, the fewer her number of relational-contextual responses.

Table 21 is presented to show the frequency patterns for the CEFT as well as the MFFT, which is examined in Question 9. Using the CEFT, subjects were classified as being either field independent (FI), those above the median number of correct response, or field dependent (FD). Seven of the 10 female subjects utilized response patterns beginning with a DPW percentage which indicates a more analytical approach. This is consistent with the Witkin concept of field independence in which a subject pays attention to details in a way that allows him to disembed a simpler figure from a more complex one.

9. To what degree is style of categorization (SCST-DPW, SCST-DG, SCST-RC, SCST-AI) associated with reflection-impulsivity (MFFT-E, MFFT-RT)?

The frequency distribution of SCST response patterns as they relate to male and females subjects classified as being reflective or impulsive with the MFFT are summarized in Table 21. Both reflective and impulsive male subjects utilized essentially the same range of response patterns while female subjects reflected a wider variety of response patterns.

The intercorrelations between the SCST and the MFFT are summarized in Table 22. In terms of the correlation coefficients between the MFFT-RT (mean response time), and the SCST category percentages, two were significant for male subjects: DPW, -.639 ($p < .017$) and RC, ($p < .025$);

TABLE 21.

FREQUENCY DISTRIBUTIONS FOR SCST RESPONSE PATTERNS WITH REFLECTIVE-IMPULSIVE AND FIELD DEPENDENT-INDEPENDENT SUBJECTS

	MFFT				CEFT			
	IMPULSIVE		REFLECTIVE		FD		FI	
	Male	Female	Male	Female	Male	Female	Male	Female
DPW-DG-CI-RC				1				
DPW-RC-DG-CI								
DPW-CI-DG-RC	2	3	1	2	2	4		5
DPW-CI-RC-DG	1		2		2		3	
DG-DPW-CI-RC		1				1		
DG-CI-DPW-RC		1				2	1	
DG-CI-RC-DPW							1	
RC-CI-DPW-DG		2	1			2	1	
RC-CI-DG-DPW		1				1		
CI-DPW-DG-RC			1		1			1
CI-DG-DPW-RC		1	1	1		2	1	1
CI-DG-RC-DPW	1		1		1			
CI-RC-DPW-DG		2		1		2		
CI-RC-DG-DPW	1	1			1	1		
Total	5	12	7	5	7	15	8	10
N	4	8	6	5	6	10	6	10
Ties	1	4	1	0	1	5	2	0

TABLE 22.

INTERCORRELATION SUMMARY OF
SCST AND MFFT

	SCST			
	DPW	DG	RC	CI
MFFT-RT				
Male	-.639(.017)	.219	.611(.025)	.387
Female	.226	-.213	-.068	-.089
Total	-.204	-.070	.358(.037)	.123
MFFT-E				
Male	.307	.107	-.370	-.125
Female	-.383(.087)	.135	.381(.089)	.124
Total	-.022	.103	-.078	.011

Level of significance, two-tailed, for $p < .10$ is listed in parentheses following each coefficient.

and one for the total sample: RC, ($p < .037$). Two significant correlations coefficients between the MFFT-E (errors) and the SCST were found for females: DPW, -.383 ($p < .087$) and RC, ($p < .089$).

From these results it appears that impulsive subjects tend to pick similar details in many picture sets of the SCST and repeat many of them thus elevating their percentage of DPW responses. Those males who tend to be more reflective take more time and do not point out the first detail they see. They then may see and report more relationships, thus increasing their percentage of SCST-RC responses.

10. To what degree is reflection-impulsivity (MFFT-E, MFFT-RT) associated with field dependence-independence?

TABLE 23.

INTERCORRELATION SUMMARY OF MFFT AND CEFT

	Male	Female	Total
MFFT-RT	.196	.350	.281
MFFT-E	-.613(.024)	-.664(.001)	-.626(.000)

Level of significance, two-tailed, for $p < .10$ is listed in parentheses following each coefficient.

The intercorrelation between the MFFT-RT and MFFT-E and the CEFT is summarized in Table 23. The strength of the interrelationship between the MFFT-E and CEFT is apparent throughout this study. These highly significant negative correlation coefficients include: males, ($p < .024$); females ($p < .001$) and total sample ($p < .000$). These two

variables were both significantly correlated for females and total sample for the WTRSD-D (reading for details).

TABLE 24.

INTERRELATIONSHIP OF SCORES
ON MFFT AND CEFT

	MFFT			
	Slow Inaccurate	Fast Accurate	Impulsive	Reflective
FD-Male	1		4	1
FD-Female	1		8	
CEFT				
FI-Male	1	1		4
FI-Female		2		4

The distribution of subjects who are classified as being either field dependent or independent on the CEFT and who are classified into one of four categories utilizing the mean response times and errors on the MFFT are summarized in Table 24. Impulsive subjects refers to those subjects who were above the error median and below the response time median while reflective subjects refers to those subjects above the response time median and below the error median. The slow-inaccurate classification refers to those subjects who were above the median on both errors and response times. The fast-accurate classification refers to those subjects who were below the median on both errors and response

time. The significant relationship between field dependence-independence and reflectivity-impulsivity is apparent.

In order to explore further this relationship between the MFFT and CEFT scores, the significant intercorrelation coefficients between the CEFT, MFFT-E, WISC-AI are summarized in Table 25. The strength of the WISC-AI correlation coefficient with the CEFT and MFFT-E is also reflected in the WISC-FS and WISC-P from which the WISC-AI is derived. It appears that either a single factor may be operating in all three variables or that they combine for a synergistic effect. For example, subjects who are field independent tend to perceive a field in a very analytic way, paying attention to details. The reflective subject tends to wait before making a quick decision in response uncertainty situation. Perhaps, the longer a subject waits the more he sees, and the more he sees, the longer he waits.

TABLE 25.

INTERCORRELATIONAL LEVELS OF
SIGNIFICANCE* SUMMARY FOR
CEFT, MFFT-E, WISC-FS, WISC-P AND WISC-AI

	1	2	3	4
1. CEFT				
Male	-			
Female	-			
Total	-			
2. MFFT-E				
Male	.024	-		
Female	.001	-		
Total	.000	-		
3. WISC-FS				
Male	.061	.173	-	
Female	.533	.914	-	
Total	.082	.294	-	
4. WISC-P				
Male	.053	.217	.000	-
Female	.153	.168	.000	-
Total	.016	.052	.000	-
5. WISC-AT				
Male	.007	.078	.000	.000
Female	.028	.066	.000	.000
Total	[illegible]	.009	.000	.000

* Two tailed.

Chapter 4

SUMMARY, CONCLUSIONS AND IMPLICATIONS

Summary and Conclusions

The purpose of this study was to examine the interrelationships between five measures of aided reading comprehension, intelligence and three measures of cognitive style variables in first grade children. The Wisconsin Tests of Reading Skill Development, Level B - Comprehension (WTRSD-B-C) yielded the five aided reading comprehension measures which were studied:

1. Identifying a paragraph topic (main idea)-WTRSD-PT.
2. Determining sequence on recalling events that happened just before or just after another event in a short paragraph WTRSD-BA.
3. Using logical reasoning in predicting outcomes-WTRSD-O.
4. Using logical reasoning in synthesizing information (cause and effect)-WTRSD-CE.
5. Reading for details, or selectively attending to and recalling details in a short paragraph-WTRSD-D.

The three measures of cognitive style variables utilized in the study are listed below.

1. Field Dependence-Independence, sometimes referred to as a global-analytic style, was measured with the Children's Embedded Figures Test (CEFT).

2. Style of Categorization, sometimes referred to as conceptual style, was measured with the Sigel Cognitive Style Test (SCST).
3. Reflection-Impulsivity, sometimes referred to as conceptual tempo, was measured with the Matching Familiar Figures Test (MFFT).

The Weschsler Intelligence Scale for Children (WISC) served as the measure of intelligence. Four scores were utilized: Full Scale, Verbal, Performance and the Analytic Index (WISC-P subtests: Block Design, Picture Completion and Object Assembly).

Thirty-four first grade subjects (13 males, 21 females) were individually administered the MFFT, CEFT and SCST with the order of tests used being randomly rotated. Each subject was then individually given the WISC. The WTRSD-B-C was given in two sittings to all sample subjects in each of two schools. Sixteen variables were obtained from scores on the above measures. Ten questions were examined through the use of intercorrelational and partial correlational techniques.

General results of the study are summarized as follows:

1. Significant relationships ($p < .01$) were found between the children's Embedded Figures Test and the Wisconsin Tests for Reading Skill Development--Details, with intelligence controlled, for females and the total sample. Field independent females, then, appear to be better able to selectively attend to and recall details from a short paragraph than field dependent females. This relationship did not exist for males when intelligence was controlled.

2. Significant relationships ($p < .01$) were found between the Matching Familiar Figures Test error score and the Wisconsin Tests for Reading Skill Development--Details, with intelligence controlled, for females and the total sample. Reflective females, then, appear to be better able to selectively attend to and recall details from a short paragraph than impulsive females. This relationship did not exist for males when intelligence was controlled.
3. Significant relationships ($p < .10$) were found between the Sigel Cognitive Style Test percentage of Descriptive Part-whole responses and the Wisconsin Tests for Reading Skill Development--Paragraph Topics test for females. Because of the problems concerning interpretation of the Sigel Cognitive Style Test results discussed previously in Chapter 3, no generalization regarding this relationship can be made.
4. The four Weschsler Intelligence Scale for Children scores (Full Scale, Performance Verbal and Analytic Index) were significantly related with 44 of the 60 coefficients cited for the interrelationships with the five aided reading comprehension measures from the Wisconsin Tests for Reading Skill Development, Level B-Comprehension (Paragraph Topic, Before or After, Outcomes, Cause-Effect and Detail). Some WISC measures correlated significantly for males and or for females only. The Before or After

test (determing sequence) was significantly related to all four WISC measures with males, females and total sample. This similarities between specific skills subsumed under the constructs of cognitive style and intelligence as they relate to the aided reading comprehension skills are suggested by the results of the present study.

5. A significant relationship ($p < .024$) existed between the Children's Embedded Figures Test and the Sigel Cognitive Styles Test percentage of Relational-Contextual responses for females. As discussed in Chapter 3, a problem with the interpretation of this relationship makes generalization impossible.
6. Significant relationships existed between the Matching Familiar Figures response times and the Sigel Cognitive Styles Test percentage of Descriptive Part-Whole responses ($p < .017$) for males and the Relational-Contextual responses for males ($p < .075$) and the total sample ($p < .037$). As mentioned previously, problems of interpretation of the SCST percentages make generalizations about these relationships difficult.
7. Significant relationships existed between the Matching Familiar Figures Test error score and the Sigel Cognitive Styles Test percentage of Descriptive Part-Whole responses ($p < .087$) for females and the percentage of Relational-Contextual responses ($p < .089$) for females. As mentioned

previously, problems of interpretation of the SCST percentages make generalizations about these relationships.

8. Significant relationships existed between the Children's Embedded Figures Test and the Matching Familiar Figures Test error score for males ($p < .024$), females ($p < .001$) and total sample ($p < .000$). These results suggest that the more reflective a subject, the more likely he would be field independent.

From the results, it appears that cognitive style variables, particularly field dependence-independence and reflectivity-impulsivity, are significantly related to two skills involved in aided reading comprehension as measured by the WTRSD-B-C. The first skill involves the selective attention paid to specific details in a short paragraph and their short term recall. The second skill involves the ability to find the main idea or paragraph topic.

The reflective subject, who studies his options for a long period of time before making a decision, is more likely to be field independent and focus on details in a paragraph. These two cognitive style variables are significantly related and appear to be associated with a common factor which also includes the skills measured by the Analytic Index from the WISC.

Implications

Data derived from the present study are interpreted as support for emphasizing the potentially important roles which cognitive

styles may play in the understanding of processes involved in aided reading comprehension and in the teaching of reading comprehension skills. Cognitive style tests may well be essential tools for examining the interaction between cognitive and affective dimensions of the reading process. Understanding individual difference variables, such as motivation, selective attention to details, the ability to refrain from rapid impulsive guessing when the correct response is uncertain and the manner in which one analyzes details when developing concepts is essential to the understanding of reading behavior and to the development of reading process models.

While the skills and processes measured by intelligence tests require certain cognitive competencies, cognitive styles play a separate role in aided reading comprehension tasks as measured by the WTRSD-B-C. For example, with intelligence controlled, there appears to be a factor including both the CEFT and the MFFT-E variables which correlates significantly with the aided reading comprehension skill of recalling specific details from a short paragraph. If a teacher could measure this factor in a student, he might be able to alter his teaching style to efficiently utilize the cognitive learning style of the student having trouble with that skill. Instructional materials could be written in a manner geared to meet the needs of students with different degrees of cognitive style variability. The usefullness of the CEFT and the MFFT in evaluating cognitive style variables with various aided reading

comprehension tasks was supported by results from the present study. Instructors of diagnostic reading classes should emphasize the potential usefulness of various cognitive style tests which have been shown to be both reliable and valid.

Further research in this field should be directed at the following:

1. Re-examination of the relationships between cognitive styles, intelligence and reading comprehension measures with progressively older male and female subjects. Are the relationships established in the present study similar to those found when the stimulus material used by the subject is not read to him while he reads it silently to himself?
2. Examination and development of reliable and valid interpretation procedures for responses to the Sigel Cognitive Styles Test. The response patterns explored by the author should be examined with a much larger sample than that employed in the present study. Response patterns may well be significantly correlated with other cognitive style measures like the CEFT and MFFT.
3. Examination, with regard to cognitive style variables, of several of the current conceptual models or theories used to explain the cognitive and affective processes involved in reading comprehension (Goodman, 1968; Ruddell

and Bacon, 1972; Geyer, 1972; and Venezky and Calfee, 1970). Testable hypotheses which would examine the various roles which cognitive styles may play should be developed and tested. For example, Ruddell and Bacon (1972) suggest the importance of affective mobilizers and cognitive strategies in the understanding of the reading process. How are styles of categorizations of reflection-impulsivity implicated in development of these affective mobilizers and cognitive strategies?

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APPENDIX A

Directions and Example of the
Children's Embedded Figures Test (CEFT)
(Witkin, Oltman, Raskin and Karp 1971, pp. 22-23)

APPENDIX A

Directions and Example of the Children's Embedded Figures Test (CEFT)

Witkin, Oltman, Raskin and Karp (1971, pp. 22-23

Each plate was enclosed in plastic to protect against cues from dirt and other marks.

Training Procedure

1. Training on the discrimination figues (D1-D4): E shows the child the first simple cut-out form (TENT) and says: "This looks something like a TENT, doesn't it? This black line at the bottom shows where our TENT rests on the ground. See if you can find another TENT that looks exactly like ours on this page." E then shows the first discrimination card, D1, and says, "Go ahead and point to the one like ours." The cut-out is then placed over the subject's choice and they are compared. Whether or not the choice is correct, it is often helpful tc examine each of the incorrect alternatives on the card and explain to the child why they are incorrect. For example, E might say: "You see, this is not like our TENT because it is too small," or "This one is not like our TENT because it is upside-down", etc. The concepts of correct shape, size and orientation on the page should be stressed.

The child is then shown the second discrimination card, D2, and so on, until he gets two items right in succession. If the child fails to reach this standard on the first trial, the series may be repeated two additional times. If the child cannot achieve two successive correct discriminations on the third repetition, testing should be discontinued.

2. Demonstrating the embedding process for children aged 6 and under (E1 and E2): Following the TENT discrimination procedure, the process of embedding a TENT figure is illustrated, using cards E1 and 2. The child holds the cut-out simple form and E says: "Find the TENT here," pointing in turn to each of the three complex figures on cards P1 and 2. E should show him where it is. E should also point out that the TENT in the complex figures is the same as the form in the child's hand, even though, for example, a line may cross it or the top part may be a different color from the bottom.

3. Practice on the embedding figures (P1 and P2): P1 is presended and E says: "A TENT like ours is hidden somewhere in this

picture. The idea of our game is to find the hidden TENT. Show me where the TENT is."

The child is permitted to retain the simple cut-out form for comparison with P1. If he indicates a correct choice, he is told: "Now you may outline the place where you saw our TENT. That's fine; now let's see how our TENT will fit."

The child is then asked to verify his choice, with the Examiner's help, if necessary, by placing the cut-out over the area where he outlined to show that they match. If the child does not indicate the correct choice, E shows him where it is and asks the child to outline the area.

E then presents P2, after taking the cut-out form from the child. E should point out that although, up to now, the embedded figure has appeared as an unbroken unit, it might also be made up of several shapes and/or colors. To encourage the child to view the picture as a whole, E says: "What does this picture look like to you?" (If necessary, E can suggest an appropriate name.) The child is then told: "Now find our TENT and outline it just the way you did before." The response is again verified with the cut-out form. E can correct or help when necessary. If the child cannot find the TENT, E shows him where it is, outlining the sides of the TENT and explaining that it is the same TENT even though it has two different colors and a line inside it. E then says: "Now you show me with your stamp where the TENT is."

Testing

For children below the age of 8 years, testing begins with item T1. Older children begin with T6 and are automatically credited with having passed T1 through T5. However, if the subject fails three or more of TENT items T7-T11, he loses this automatic credit and is given T1 through T5.

Testing is stopped upon completion of the TENT series if the subject fails all items T7-11. If at least one of these five items is passed, testing continues with the HOUSE series.

Before presenting the items in the HOUSE series (H1-14), E presents Discrimination Series D5-8, following the directions given for D1-4. E then gives card P3 as the single practice item for the HOUSE series and after that proceeds to H1, continuing until there have been five consecutive failures.

In presenting the first three test items in each series, E follows the procedure given for P2, saying: "What does this look like to you?" and after the child has named the figure in any appropriate way, E says, "Now find our TENT (or HOUSE) and outline it just the way you did before." E should make sure the cut-out TENT or HOUSE forms are not visible to the child. The Examiner may assist or correct a child who does not arrive at the solution, although these are scored as failures.

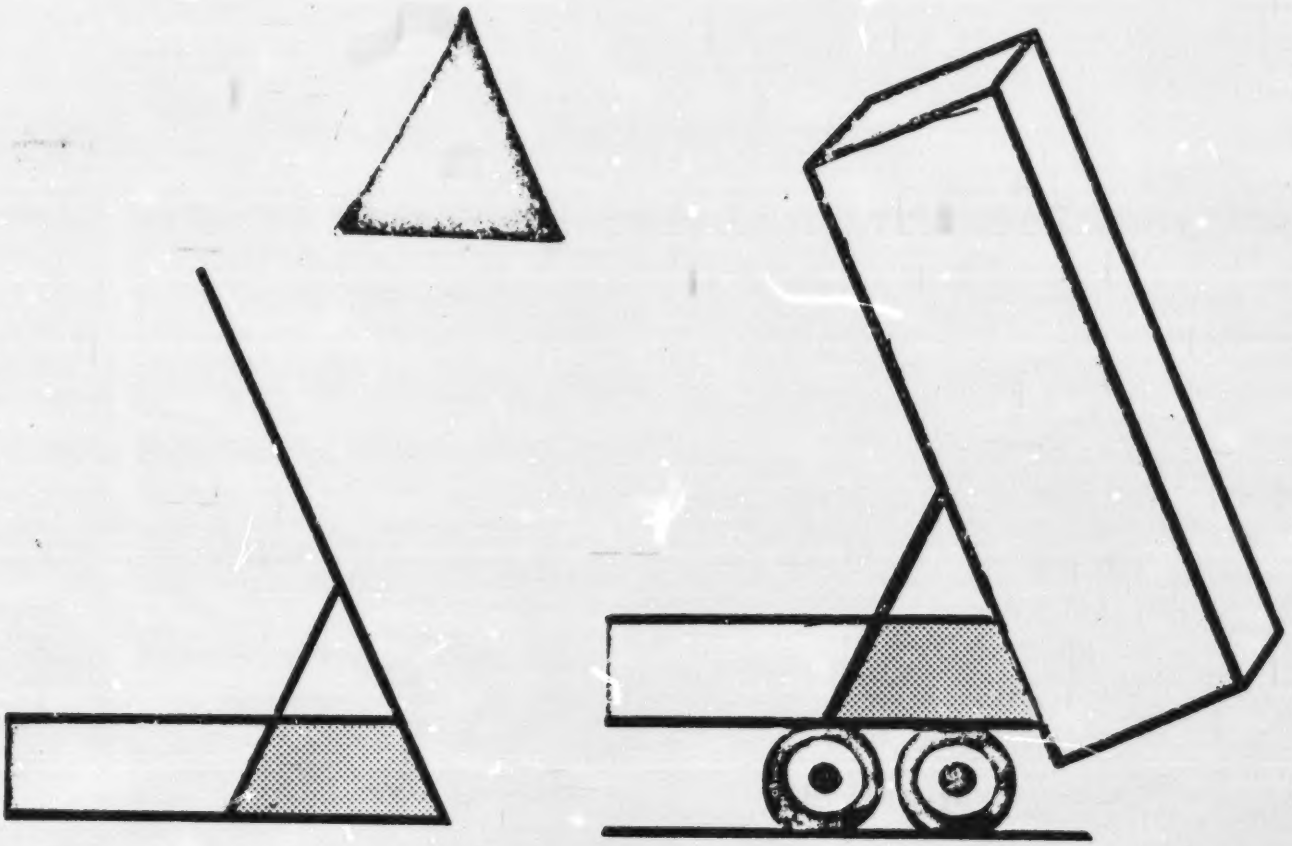
After the first three items in each series, the child is not shown the cut-out unless he specifically asks to see it, unless he fails three consecutive items, or as already described, when it is shown to

enable him to verify his choice. The child is informed whether he has succeeded or failed on any item only under the conditions specified earlier.

Scoring

Responses are scored 1 or 0. A score of 1 is given only when the first choice is correct and verified, as previously described in the "Training" section. If an incorrect choice is spontaneously corrected before the child sees the cut-out model, full credit is given. Correct choices made after the model is seen are scored as failures. The total score equals the number of items passed, 25 being the maximum score.

Example



APPENDIX B

Directions and Example of the Adapted Form
Sigel Cognitive Styles Tests (SCST)
(Sigel 1967)

APPENDIX B

Directions and Example of the Adapted Form

Sigel Cognitive Styles Tests (SCST) - Sigel (1967)

Timing: Cards 2-3 -- 90 seconds
Cards 4-35 -- 75 seconds

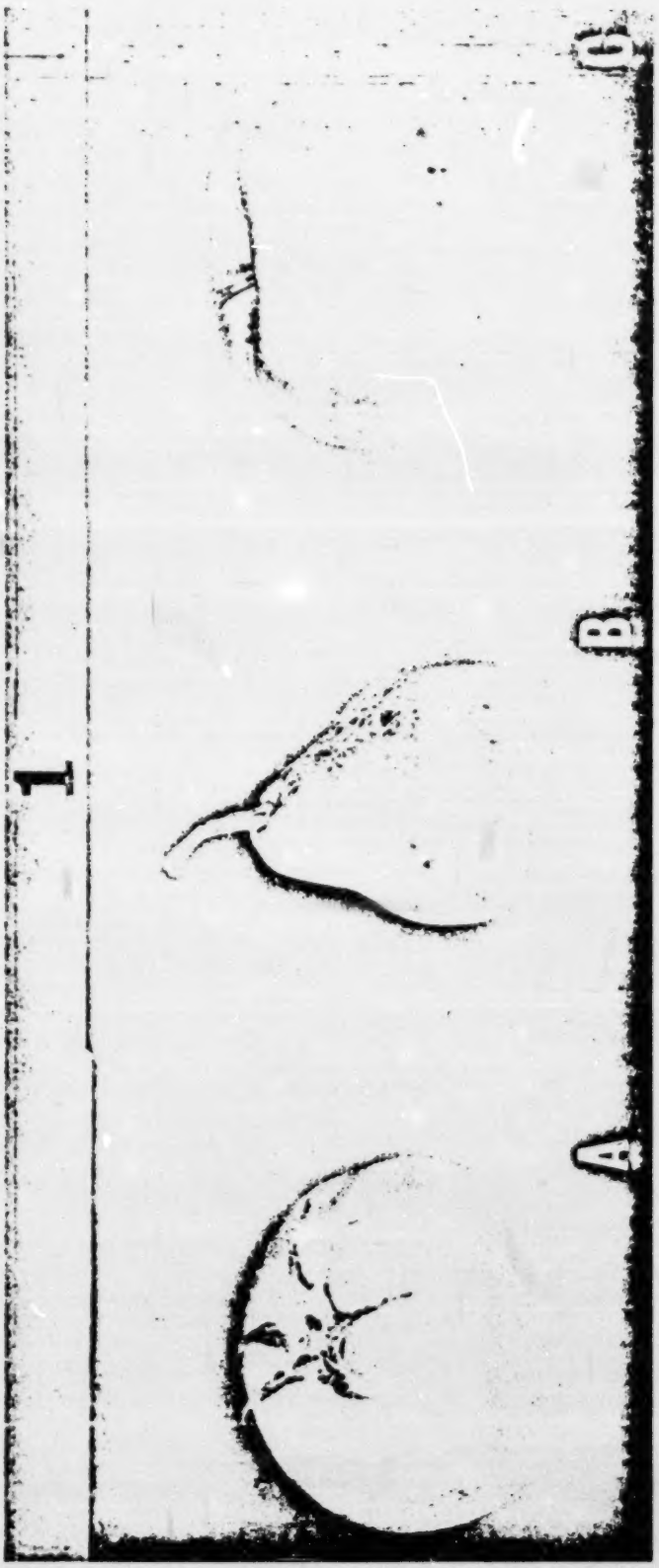
Present Card I in either the Form M (boys) or Form F (girls) to the Subject and say:

> "Here is a set of cards on which are pictures of many familiar things. On card number 1 you can see three pictures: the tomato has an A under it; the pear has a B underneath; and the apple has a C beneath it. What I want you to do is pick out any two of the three pictures which go together, belong together or are related in any way. When you select two of them, tell me and I'll write them down. Then I want you to tell me why you picked those two." Pause for reasons, then point out other possible pairings giving some example reasons.
>
> "When I turn over each of these cards I want you to tell me as many pairs as you can which go together, belong together or are related in any way and give me a reason for each choice. I will tell you when to stop." Allow 75 or 90 seconds depending on card numbers.
>
> "There are no right or wrong answers. I am interested in the different ways children see things. You may see many things or only a few. If you wish to change your reason simple tell me. If you can't think of any more pairs before I say 'stop', just tell me." Do not prompt.

Proceed through the appropriate form using the following format:

Card No.	Pair	Responses	Categories
Example 1	A,C	Both are round.	
	A,C	Both are red.	
	B,C	Can eat them.	
	B,C	Got stem-like things.	
	A,B	Both grow in a garden.	

Example



APPENDIX C

Directions and Example of the Matching
Familiar Figures Test (MFFT)
(Kagan 1965a)

APPENDIX C

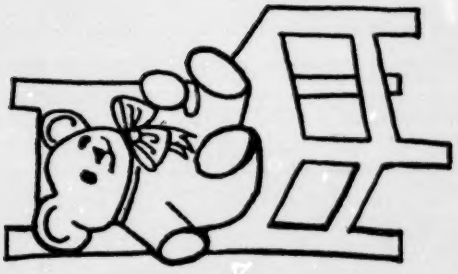
Directions and Example of the Matching Familiar Figures Test (MFFT) - Kagan (1965a)

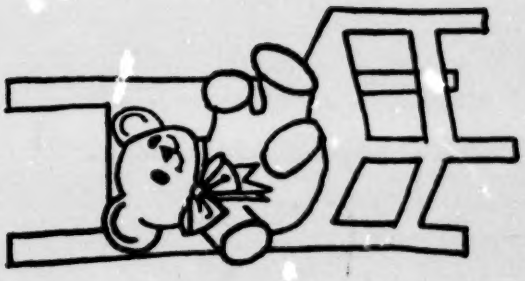
"I am going to show you a picture of something you know and them some pictures that look like it. You will have to point to the picture on the bottom page (point) that is just like the one on this top page (point). Let's do some for practice." E shows practice items and helps the child to find the correct answer. "Now we are going to do some that are a little bit harder. You will see a picture on top and six pictures on the bottom. Find the one that is just like the one on top and point to it."

E will record latency to the first response to the half-second, total number of errors for each item and the order in which the errors are made. If S is correct, E will praise. If wrong, E will say, "No, that is not the right one. Find the one that is just like this one (point)." Continue to code responses (not times) until child makes a maximum of six errors or gets the item correct. If incorrect, E will show the right answer.

Example

Example





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APPENDIX D

Directions and Example of the
Wisconsin Tests for Reading Skill Development,
Level B--Comprehension, TEST 1: Paragraph Topics
(Otto 1973, pp. 7-8)

APPENDIX D

Directions and Example of the
Wisconsin Tests for Reading Skill Development,
Level B--Comprehension, TEST 1: Paragraph Topics
(Otto 1973, pp. 7-8)

Each student in the group is given a copy of the test booklet with his or her name on it. A chalkboard demonstration is given to show them how to fill in the answers with their pencils.

General Instructions

> These tests are about what you learn and remember from stories and sentences. It's important for you to do your best. After you take the tests we'll find out what things you already do well. We'll also find out what you need to know more about so we can spend more time helping you to learn those skills.

Test 1 Instructions-Paragraph Topics, Form I

> In this test you'll decide what stories are about. Look at the example box on this page (point). In the box is a story. Read the story silently as I read it out loud. Then I'll ask a question about the story. Listen carefully. Ready?
>
> > He picked up one dish at a time. He put it in the soapy water. Then he washed it with a cloth and cleaned it in clear water. He set the clean dishes down to dry.
>
> What was the whole story about? "A, cloth. B, drying. C, soapy water. D, washing dishes. (Wait for a response.) Good. The whole story was about washing dishes. Mark your answer by filling in the circle beside washing dishes, answer choice D in the example box. (Check to see that all children answered correctly.)
>
> You will do the rest of the stories just like you did the example story. I will read each story and the answer choices to you but from now on I cannot help you choose the answer. You will fill in the circle next to the answer that tells what the whole story is about. When you're not sure which answer is correct, mark the answer you think is right. Remember that you are not to talk during the test. Do not say any of your answers out loud. Ready?

(Read each story and the answer choices only once. Wait until all children have completed an item before proceeding to the next item.)

Test 1 Instructions-Paragraph Topics, Form I (cont'd.)

Example

He picked up one dish at a time. He put it in the soapy water. Then he washed it with a cloth and cleaned it in clear water. He set the clean dishes down to dry.

(A) cloth
(B) drying
(C) soapy water
(D) washing dishes

APPENDIX E

Directions and Example of the
Wisconsin Tests for Reading Skill Development,
Level B--Comprehension, TEST 2: Before or After
(Otto 1973, pp. 12-13)

APPENDIX E

Directions and Example of the
Wisconsin Tests for Reading Skill Development,
Level B--Comprehension, TEST 2: Before or After
(Otto 1973, pp. 12-13)

Each student in the group is given a copy of the test booklet with his or her name on it. Procedure for penciling in answer is reviewed.

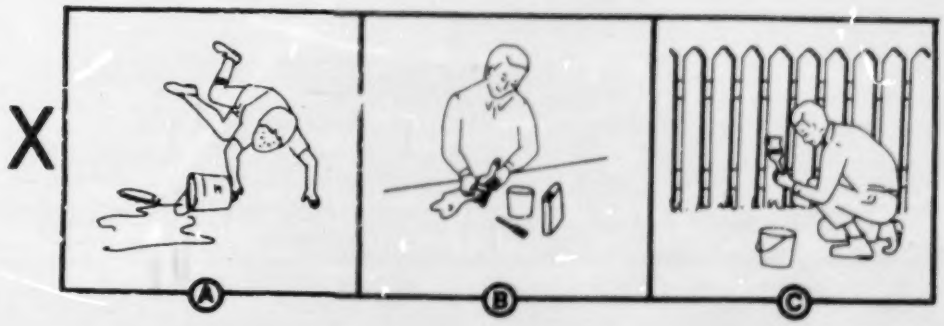
Test 2 Instructions--Before or After

> This test is about when things happen in stories. Look at the row of pictures beside the X. (Point.) I am going to tell you a short story. I'll ask you to mark the picture that shows what happened before one part of the story. (Pause.) Listen carefully and I will read the story to you.
>
> > Ken's dad was painting the fence. He was almost out of paint and sent Ken to get some more. On the way back, Ken tripped and spilled the can of paint. Suzy came along on her roller skates and helped Ken clean up the mess. When they got home, Ken's father had finished the fence. He was already cleaning his brush.
>
> Which picture in the row shows what happened just before Suzy came by on roller skates? (Wait for a response.) Good. The picture of the boy with the spilled paint. Ken spilled the paint just before Suzy came along on her skates. Mark your answer by filling in the circle under the picture of the boy with the spilled paint. (Check to see that all children answered correctly.)
>
> The rest of the test is like the example we just did, but from now on I cannot help you. For each row look at the pictures while I read a story. Then I'll ask you what happened before one part of the story. For each row you will fill in the circle under just one picture. When you're not sure which picture is correct, mark the picture you think is right. Remember that you must listen very carefully. Keep your answer to yourself. Don't work ahead, and don't say anything out loud. Ready?

(Read each story and question once. Wait until all children have completed an item before proceeding to the next item.)

Test 2 Instructions--Before or After (cont'd.)

Example



APPENDIX F

Directions and Example of the
Wisconsin Tests for Reading Skill Development,
Level B--Comprehension, TEST 3: Outcomes
(Otto 1973, p. 16)

APPENDIX F

Directions and Example of the
Wisconsin Tests for Reading Skill Development,
Level B--Comprehension, TEST 3: Outcomes
(Otto 1973, p. 16)

Each student in the group is given a copy of the test booklet with his or her name on it. Procedure for penciling in answer is reviewed.

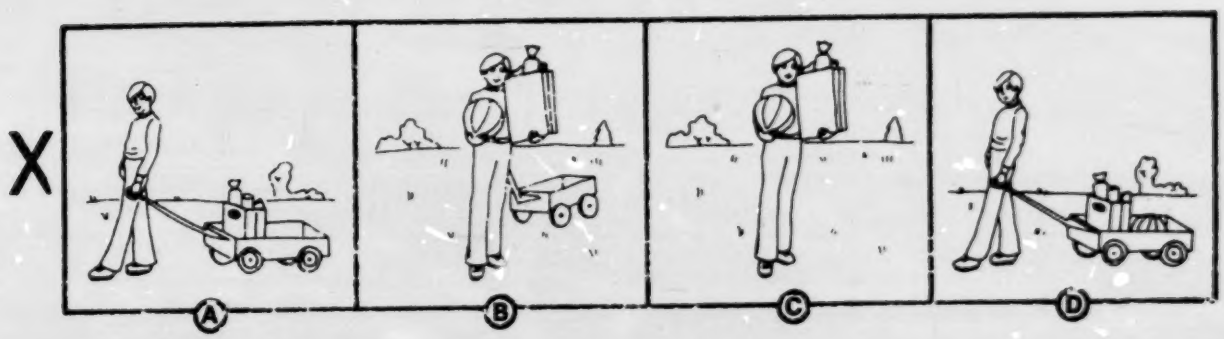
Test 3 Instructions--Outcomes

> This test is about what might happen right after a sentence I will say to you. Look at the row of pictures beside the X on this page. (Point.) I am going to say a sentence to you. Decide which picture in the row shows what might happen right after the sentence. Listen carefully. John picked up the ball, put it in his wagon, and pulled the wagon to the grocery store. Which picture shows what might happen right after the sentence. Listen carefully. John picked up the ball, put it in his wagon, and pulled the wagon to the grocery store. (Wait for a response.) Good. The last picture does. It shows John pulling his wagon with the ball and a bag of groceries in it. Mark your answer by filling in the circle under this picture. (Check to see that all children answered correctly.)
>
> The rest of the test is like the example we just did, but from now on I cannot help you. For each row I'll read a sentence to you. You will decide which picture shows what might happen right after the sentence I say. For each row you will fill in the circle under just one picture. When you're not sure which picture is correct, mark the picture you think is right. Remember that you must listen very carefully. Keep your answer to yourself. Don't work ahead, and don't say anything out loud. Ready?

(Read the directions for each item only once. Wait until all children have completed an item before proceeding to the next item.)

Test 3 Instructions--Outcomes (cont'd.)

Example



APPENDIX G

Directions and Examples of the
Wisconsin Tests for Reading Skill Development,
Level B--Comprehension, TEST 4: Cause-Effect
(Otto 1973, p. 19)

APPENDIX G

Directions and Examples of the

Wisconsin Tests for Reading Skill Development,

Level B-Comprehension, TEST 4: Cause-Effect

(Otto 1973, p. 19)

Each student in the group is given a copy of the test booklet with his or her name on it. Procedure for penciling in answer is reviewed.

Test 4 Instructions-Cause-Effect, Form I.

> This test is about deciding whether one thing will make another thing happen. Look at the examples on this page. Read the two sentences for Example X silently as I read them aloud. "A, The cat cut a foot." (Pause.) "B, She had a bad limp." Would sentence A, "The cat cut a foot," have caused sentence B, "She had a bad limp"? (Wait for a response.) Good. Yes, sentence A could have caused sentence B. A cut foot might cause an animal to limp. Mark your answer to example X by filling in the circle under Yes beside these two sentences. (Check to see that all children answered correctly.)
>
> Now read the two sentences for example Y. "A, Suzy's pen was red." (Pause.) "B, She lost it." Would sentence A cause sentence B? (Wait for a response.) That's right. It would not. The color of a pen would not cause someone to lose it. Mark your answer to example Y by filling in the circle under No beside these two sentences. (Check to see that all children answered correctly.)
>
> The rest of the test is just like the examples. I'll read the sentences to you, but from now on I cannot help you answer the question. You'll decide whether the thing in sentence A would make the thing in sentence B. happen. Then fill in the circle under Yes or No. When you're not sure which answer is correct, mark the answer you think is right. Remember that you must listen very carefully. Keep your answer to yourself. Don't work ahead, and don't say anything out loud. Ready?

(Read each pair of sentences and the question only once. Wait until all children have completed an item before proceeding to the next item.)

Test 4 Instructions-Cause-Effect, Form I (cont'd.)

Examples

		Would A cause B?	
X	A. The cat cut a foot.	Yes	No
	B. She had a bad limp.	O	O
Y	A. Suzy's pen was red.	Yes	No
	B. She lost it.	O	O

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APPENDIX H

Directions and Examples of the
Wisconsin Tests for Reading Skill Development,
Level B--Comprehension, TEST 5: Detail
(Otto 1973, p. 24)

APPENDIX H

Directions and Examples of the

Wisconsin Tests for Reading Skill Development,

Level B-Comprehension, TEST 5: Detail

(Otto 1973, p. 24)

Each student in the group is given a copy of the test booklet with his or her name on it. Procedure for penciling in answer is reviewed.

Test 5 Instructions-Detail, Form I

This test is about what happens in stories. Look at the example box on this page. (Point.) In the box is a story. Read the story silently as I read it aloud.

> It was a busy day for Susan and her father.
> In the morning they flew in a small airplane.
> In the afternoon Susan went swimming. In the
> evening Father went sailing with some friends.

Now I am going to ask you a question about the story. Look at question X. "Who flew in the airplane? A, Susan only. B, Father only. C, Susan and Father. D, friends." Look in the story and find who flew in the airplane. (Wait for a response.) Good. The story says both Susan and Father flew in the airplane. Mark your answer to question X in the example box by filling in the circle next to the words Susan and Father, answer choice C. (Check to see that all children answered correctly.)

Now look at question Y. "When did Susan go swimming? A, in the afternoon. B, in the evening. C, when Father went sailing. D, when Father went flying." Look in the story and find when Susan went swimming. (Wait for a response.) Good. The story says Susan went swimming in the afternoon. In the example box fill in the circle next to the words in the afternoon, answer choice A. (Check to see that all children answered correctly.)

You will do the test questions just like you did the example questions. I will read the stories and the questions to you but from now on I cannot help you find the answers. You will fill in the circle next to your answer choice. Remember

Test 5 Instructions-Detail, Form I (cont'd.)

to look in the stories and find the word or words that will answer the questions. When you are not sure which answer is correct, mark the answer you think is right. Remember that you are not to talk during the test. Do not say any of your answers out loud. Ready?

(Read stories, questions, and answer choices only once. Wait until all children have completed an item before proceeding to the next item.)

Examples

It was a busy day for Susan and her father. In the morning they flew in a small airplane. In the afternoon Susan went swimming. In the evening Father went sailing with some friends.

X Who flew in the airplane?
- (A) Susan only
- (B) Father only
- (C) Susan and father
- (D) friends

Y When did Susan go swimming?
- (A) in the afternoon
- (B) in the evening
- (C) when Father went sailing
- (D) when Father went flying

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